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# HINTS TO RIFLEMEN.

BY

H. W. S. CLEVELAND.

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## P R E F A C E.

My object in the following treatise has been to create and promote a general interest in a subject which I have long believed to be one of National importance. As I make no claim to the title of a scientific man, I should hardly have presumed to put forward opinions which have been drawn mainly from practical experience, but for the encouraging reception which has been given to my shorter essays, which I was induced to prepare, from the strong conviction I felt of the deficiency of public interest in the subject, and because (so far as I am aware) the only recent publications in this country relating to it, were scientific treatises, not calculated to interest the general reader.

I offer these "hints" as the contribution of an old sportsman, and if I succeed in any degree in

exciting an interest in the subject, my end will have been gained, even if the future investigations of those who are thus attracted, should prove any of my opinions to be erroneous.

To the friends who have furnished or aided me in procuring materials and information, which have proved of value to me in its preparation, as well as to those who have given me the encouraging help of a friendly interest in the undertaking, I offer my grateful acknowledgments.

My thanks are especially due to Messrs. WM. READ & SON and Messrs. PALMERS & BATCHELDERS, for furnishing me with arms and materials, which have been of essential service in conducting my experiments.

H. W. S. C.

DANVERS, MASS., *Nov.* 1863.



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# HINTS TO RIFLEMEN.



## CHAPTER I.

### SKILL OF ANCIENT ARCHERS, AND SPIRIT OF EMULATION EXISTING IN THEIR DAY.

THE skill of the old English archers is one of the many facts in history, which everybody recognizes as a general proposition, but of the actual power which they wielded there is at this day but little realizing appreciation.

We know, generally, that many of the hardest fought battles of those days were won by the power and skill with which they plied the bow, but comparatively few people are aware how important a part that weapon has played in England's history, or to what an extent its use was encouraged and enforced upon the people. The social and military necessities of the present day are so changed from those which existed five hundred years ago, that it is as difficult for us to realize the feelings and interests which then held the most prominent place in the minds of the great masses of the people, as it

would have been for them to anticipate the day when the knowledge of arms would be looked upon as a vain acquisition, unworthy the thought or attention of men who aspired to distinguished social or civil position.

Our own recent experiences have afforded sufficient ground for belief that in our zeal for the promotion of the objects which we now consider most essential for the advancement of civilization and happiness, we have too much neglected the physical training which was then thought a primary necessity for their preservation. If not enervated by the prosperity and luxury which we have enjoyed, we have certainly lost that taste for the skilful use of arms which alone is capable of imparting the individual confidence of power, which constitutes the vital strength of military discipline.

For a period of five hundred years succeeding the battle of Hastings, which was fought on the 14th October, 1066, the archers of England constituted a National Guard, whose efficiency was known and feared throughout Europe, and the most vigilant care was exercised by the Government to maintain the supremacy they had acquired. Every able-bodied man between the ages of seventeen and sixty was obliged, under a severe penalty, to have a bow of his own length, and a certain number of arrows, and to practice habitually in shooting at the butts

or targets which were established in every parish, at distances prescribed by law.

On holidays and festive occasions, prize shooting was always one of the standard sports, and every effort was used to dignify and excite an interest in the attainment of an art on which the power and even the very existence of the nation was felt to be dependent.

A little reflection upon the obvious results of such a tone of public feeling, as compared with those arising from the prevailing sentiment of the present day, will enable us, in some degree, to realize the change which has taken place, and to appreciate the danger of neglecting so important a branch of popular education as that of the use of arms.

The use of the gun has been regarded by many among us as a species of idle dissipation, which at best could only be looked upon as a mere waste of time. Instead of making it a part of every boy's education, and having him instructed and drilled till he became so familiar with the weapon that no danger was to be apprehended to himself or others, it has been a forbidden implement in the house, and he has had no other instruction than he could gather for himself, perhaps by stealth; for whatever may be the explanation, the fact cannot be denied, that a craving for its use is one of the

strongest instincts of a boy's nature, and with many it is so strong as to be irresistible. As a natural consequence, the few whose innate taste for it was strong enough to resist the tyranny of public opinion, have been tolerated rather than encouraged, and in very many instances have been driven by the force of that opinion into habits of dissipation which had no natural connection with the manly and health-giving art which might and ought to have been made the means of preserving them from such evils, if they had been encouraged to a rational indulgence of the honest instincts of their nature.

The day came at length that warriors were needed, and a zealous army stepped forth, animated by the noblest motives; but when it came to be organized, in thousands of instances the men who were selected as officers because of their knowledge of the use of arms, were found to possess no moral character, while the ranks were filled with exemplary graduates of our free schools and colleges, who had not only never fired a gun in their lives, but had been brought up in a wholesome fear of gunpowder, hardly conducive to the most fitting frame of mind for the battle field, or the achievement of deeds of chivalrous daring.

If the reader will now picture to himself how different would have been our situation had the old

laws and customs prevailed, when every man was trained to the familiar use of his weapon, and the attainment of the greatest possible perfection was stimulated by the prospect of public honor, and a certainty of the most vigorous competition, he can hardly fail to acknowledge that we have at least been guilty of a grievous sin of omission in suffering such a change to come upon us.

The fact, however, seems generally to have escaped observation that the spirit of emulation which existed in the days of archery was in a great measure owing to the character of the weapon itself, whose efficiency was so largely dependent upon the strength and skill of the one who used it, as to furnish a never failing incentive to exertion in perfecting himself in its use by constant practice.

With the invention of gunpowder, whose projectile force is entirely independent of the strength of the shooter, while the weapons in which it was first used afforded little scope for the display of superior skill, the archery meetings and prize shootings, which for so long a time had formed an important feature of the life and education of the people, passed into disuse except as a mere sport.

For the last two centuries the English soldier has been a mere hireling, armed with a weapon possessed of no responsive power to the exertion of skill in its use, which should lead to a feeling of

reliance, amounting almost to affection on the part of its owner, but whose execution could only be estimated in the aggregate, and of course afforded no evidence of individual skill or prowess. The improvements which have been made in our own day, however, in the construction of the rifle, have wrought a revolution in the use of arms, which bids fair to awaken a popular spirit not at all inferior to that of the days of archery, with the substitution of a weapon, whose amazing power and efficiency, as well as its wonderful precision, and the readiness with which it seems to acknowledge its obedience to the will of a skilful manager, constitute such an arm as has never before been wielded in the struggles between right and might, which comprise so large a portion of the world's history. The day is past when battles could be won with so feeble a weapon as the smooth-bored musket, and the Governments of Europe have awakened to the fact that the element of individual skill must again become an essential ingredient in the composition of an army.

The response of the 200,000 volunteers who have enrolled themselves in Rifle Clubs throughout England, and the revival of shooting matches, sustained and animated by royal patronage, proves that the ancient spirit of her people has lost none



of the vigor it possessed in the days of bows and cloth yard shafts.

Since the commencement of the struggle in which we have now been engaged for two years, the attention of our best mechanics has been very generally directed to the subject of fire arms, and many very valuable improvements have resulted from their efforts, some of which have already been largely introduced, while others of real and substantial merit, owing to the difficulty of starting a new manufacture, requiring a large capital, have never got beyond the production of a model.

Some of these inventions derive their value from the discovery and application of new principles, developing powers previously unknown, but by far the greater part are merely mechanical arrangements for facilitating the manipulations and operations, on whose simplicity and ease of performance the efficiency of the weapon must in a great measure depend.

The subject of improvements in fire arms, however, when examined in reference to their military use, involves the consideration of a great many points which are matters of indifference to the sportsman or amateur rifleman. For the use of troops of the line on the field of battle, the Springfield and Enfield rifles comprise, perhaps, all that is necessary in point of range and precision.

In the dust and smoke of a battle field, it is rare that an opportunity occurs to select an object to aim at, and the fire is for the most part delivered at random. Yet occasions may arise when a greater degree of precision may be exceedingly desirable, but unless the troops have been trained as marksmen, it is of no avail to provide them with weapons whose efficiency is dependent upon the skill of the shooter quite as much as upon the perfection of the gun. The object of almost all the recent improvements has been to facilitate the operation of loading, in order to enable the soldier to deliver his shots in rapid succession, at the critical moment, when such power may be the means of deciding the crisis of a fight, and also to relieve him from the exposure incident to the awkward process of drawing and returning the ramrod and ramming the cartridge. Desirable as these objects may be, however, their attainment is fraught with evils which more than counterbalance the benefits accruing from them, unless the troops are thoroughly drilled in their use, and under such discipline as to leave no room for apprehension that they will misuse their advantages. The waste of ammunition from rapid firing, is even now a constant cause of complaint, and obviously a just one, as may be seen by the small amount of injury inflicted in proportion to the number of shots which are fired. Sixty

rounds of ammunition is as much as a soldier can carry into the field, and with many of the breech loading guns these might be all deliberately fired in fifteen minutes. It is obvious, therefore, that unless they were placed in the hands of properly trained troops, a second army would be required to supply the first with ammunition. But it is equally obvious that if so trained, the troops which were thus armed would possess an inestimable advantage over opponents who were provided only with muzzle loaders.

The remedy, therefore, seems to lie in more perfect discipline. Perhaps it might act as a stimulus upon the troops, to make the possession of breech loading arms a reward for good behavior on the field, giving them only to such regiments as had proved their efficiency and courage beyond all doubt.

The argument against them proves only that the soldier has not been taught the first principles on which his efficiency depends, and without which no degree of perfection he may have obtained in the other parts of his drill will be of any avail, for the grand object of discipline is to place him in the field in such a position that he may use his weapon with effect, and if he does not know how to use it, the object for which he is sent into the field is defeated. But such knowledge implies much more

than merely knowing how to load and fire, and until soldiers are thoroughly instructed in target shooting, and so well disciplined as to be easily kept in hand by their officers, it may as well be conceded that little or nothing will be gained by arming them with weapons whose superiority would give them an incalculable advantage if they were capable of improving it. I am persuaded that very great misapprehension prevails in regard to the kind of education required by the soldier to be of any practical value in actual service.

I have been assured repeatedly, by officers who have taken very great pains in training their men beforehand, that the only men who were to be relied on, were those whose long familiarity with the use of the gun was such that they instinctively held and pointed it in the right direction, while those who had had only such instruction as the soldier receives, in estimating distance, arranging sights, &c., were often seen in action firing into the ground, or into the air, quite unconscious of what they were doing. The fact that for the most part no enemy can be seen, and the fire can only be directed at the flashes of the guns, proves the absurdity of supposing that nice marksmanship can be of any avail in a general engagement; but, on the other hand, it is only by the intuitive skill in handling the weapon which comes of long practice in hunting and target shoot-

ing, that one acquires the power of giving such general precision to his fire at such a time as will prevent its being utterly thrown away, or even directed upon his fellow soldiers. Such skill is not to be attained by the man who has never before fired a gun by simply being subjected to a course of military drill and target practice. Yet I would not be understood as undervaluing such discipline. I fully recognize its importance, but it cannot confer the confidence of individual power which is felt by the man whose weapon comes to its place with the instinctive ease which can only result from long familiarity. Discipline confers the confidence of power derived from the best possible mechanical arrangement of the masses whose united strength is relied on to accomplish the desired object; but individual skill gives to each of the units composing those masses the self confidence which in fact constitutes their strength.

No one at this day will deny the probability that henceforth a powerful military organization must be one of the necessities of our national existence, and whether or no our liberty is to be maintained, is dependent upon whether such organization be in the form of a standing army to whom we confide the power of guarding us from invasion and putting down rebellion, or a national guard, of which every citizen is a member, and

liable to service on approach of danger. If we would avoid the necessity of the former, we must adopt the latter arrangement. It is not for me to suggest plans for military organizations, of which I know only enough to enable me to appreciate my own ignorance, but the essential point on which military efficiency must depend in the hour of trial, consists in such familiarity with the use of arms as the civilian may attain without the necessity of military drill, and which once acquired, will give him such confidence of power as no mere drilling can inspire.

It is, therefore, as a means of increasing our national strength, by having in every community a large body of men who may at any time be converted into efficient troops, that it is desirable to inspire a popular taste for the use of the rifle; the most formidable weapon which has ever yet been placed in the hands of the soldier, and on which we must mainly rely for the performance of the work of war.

In order to encourage the growth of such a taste, it is not enough to leave it to those only who are under military instruction. We must organize Rifle Clubs for target practice, and excite a spirit of emulation by the stimulus of public shooting matches for prizes. It is of primary necessity to do away at once with the feeling which has heretofore

prevailed, that the use of the rifle is at best but an idle accomplishment, whose attainment afforded *prima facie* evidence of a tendency to dissipation. The encouragement which of late years has been given to physical training will go far to aid in abolishing this prejudice. The use of the rifle involves the necessity of muscular exercise in the open air, and possesses at the same time an intrinsic interest which will admit no flagging of the zest which accompanies its performance. And when in addition to this it is considered that it affords a ready and vitally important means of adding to our national strength, it may justly be regarded as the most desirable method of securing the benefits of physical education.

It is but a few years since we were accustomed to speak of the English as deficient in knowledge of the use of arms, and a great deal of wit was expended upon the first attempts in that country to convert shopkeepers into riflemen. But in spite of ridicule and determined opposition on the part of some who were fearful of trusting the people with their own guardianship, the thing has been done, and that so thoroughly that all the world knows and feels that England of to-day compares with England of ten years ago as a man in armor and familiar with his weapons compares with the same man in a frock behind the plough. It is not the

increase of her army and navy which conveys this feeling to the minds of her neighbors, but the conviction that they are but the outward manifestation of a power pervading the whole nation. The edge of the sword is sharp, and it is seen that the whole blade is of the same temper of steel.

But this has not been brought about by merely drilling the men who were or might be soldiers. A very large portion of those who have taken an active part in promoting the interest in the "rifle movement," are persons who would never expect or be expected to render active service in the field, but it is only by the active participation of such persons, that those whom it is really important to instruct can be led to take an interest in it. In short, it is only by acting upon the imitative propensity, or in other words by making it fashionable, that any such general movement can be accomplished.

A great deal of sport was indulged in by the newspapers on the occasion of the Queen of England firing a shot at the target with a rifle which had previously been pointed for her; but in reality it was one of the best shots that ever was made. It went straight to the heart of every Englishman, and impressed him with the conviction that this was the form in which he must prove his loyalty.

The same effect will be produced with us when



the same springs are touched. It will not suffice for the leaders of public opinion to tell the people to set about the work. They must begin it themselves in every community, and say by example as well as precept: "This is what every man must do who would contribute to the national strength." And the appeal will be answered with willing hearts and hands, and in the day of need it will be found that we have the elements of power in our own hands instead of having to create it at a ruinous expense.

And we may rest assured that the other civilized nations of the earth are fully awake to the importance of popular education in the use of arms, and unless we also recognize and act upon the fact that the day has come round again when individual skill constitutes a vitally important element of military education, we shall some day pay dearly for being taught the lesson in the field.

## CHAPTER II.

### GENERAL PRINCIPLES OF RIFLE PRACTICE.

THE peculiar construction of rifled guns which gives them their superior accuracy, can be better understood by looking through the barrel of a rifle, than by any description; and as this may be done with almost any of the breech-loaders, which are now to be found in every gunshop, I will ask my reader to be kind enough (if he has never seen the inside of a rifled barrel) to take the first opportunity of making such inspection. He will perceive that the tube of highly polished steel through which he is looking, is cut with a number of shallow grooves, running through its whole length, and turning from right to left, or from left to right, with a greater or less degree of twist, and he will comprehend at once that the bullet, being made to fit exactly in these grooves, must acquire a spinning motion on its axis, which will be continued in its flight through the air.

The accuracy of shooting which is attainable

with the rifle, is due solely to this motion, which neutralizes the effect of any inequalities of surface or weight in the bullet, by bringing them in rapid succession to the same point of bearing upon the atmosphere. The manner of cutting the grooves, and the degree of twist given to them, have been the subjects of a very great variety of experiments, and much diversity of opinion still prevails among riflemen and rifle makers in regard to the details of construction.

John R. Chapman, whose treatise on the "Improved American Rifle," published in 1848, is the most thoroughly practical and satisfactory work on the subject that I have met with, lays down the following principle: "It is obvious that the proper degree of twist is the great point to be obtained; for it is evident that too little will not spin the bullet sufficiently quick to equilibrate its form and irregularities, and it will soon cease to fly true; whereas too much will produce too much friction in the barrel, and in the course of the flight of the bullet also, by presenting its surface in too quick succession to the action of the atmosphere; consequently, whatever degree of twist is given to the bullet more than is requisite for its true flight, necessarily retards its motion, and is so much power or powder actually thrown away."

He then gives different calibers and degrees of

twist, deduced from his own experience, as the best for different ranges, increasing the caliber and the degree of twist for long-range shooting. He advocates the gaining twist under all circumstances, and a twist ending with one turn in three feet is the shortest recommended by him for any range.

General Jacobs, who probably expended more time, labor and money in experiments with rifled guns than any other man ever did, found that with balls cast with projections to fit the grooves, the twist could be increased to any extent without danger of stripping. He gave his guns, therefore, one complete turn in thirty inches, but afterward found that the amount of twist should be proportionate to the length of the barrel, and four fifths of a turn in that length is about the best for all purposes.

The gaining twist is considered by our best riflemen to be absolutely essential to the attainment of the greatest possible degree of perfection of shooting. In this method of rifling, the grooves start from the breech with only a slight twist, which gains more and more of a spiral form as it proceeds, and ends with whatever degree it is desired to impart to the bullet. It is obvious that this is an application of the same principle by which the wedge attains its power, and there can be no doubt of its value under certain circumstances, yet its effect is

denied, and the principle derided by most of the foreign writers on the subject. As I shall consider the reasons for this difference of opinion, in treating of the American Target Rifle, I will only express my conviction here, that it is like the famous dispute concerning the gold and silver shield, in which both parties were right.

It would seem as if there were no study involving so much difficulty in reconciling theory to practice, as in that of rifled guns and their projectiles, and we find continually that principles which we have considered so firmly established by one series of experiments, that we may safely rest upon them as foundations for future theories, are completely knocked from under us by some new and unexpected revelation.

Thus it would seem to be a self-evident proposition, that a sharp twist of the grooves, causing enormous friction by the tendency which the bullet must have to drive straight out across their threads, must materially affect its velocity and consequent force or range. It has, accordingly, long been considered a settled principle, that the degree of twist ought to be as slight as possible, consistently with the attainment of the object of keeping the bullet spinning to the end of its flight, and this has varied according to size, shape and weight of bullet between the rates of one turn in three or one in

four feet. To one who has not reflected upon the subject, this would not seem a very sharp twist, but if he will stand near a target when a bullet is fired at it from the distance of 100 yards, he will perceive that there is not an appreciable interval of time between the report of the gun and the passage of the bullet through the target ; yet with a twist of one turn in three feet, it must have made 100 revolutions upon its axis in that small fraction of a second, and he may thus form a conception of the friction it must encounter during the hundredth part of that fraction occupied by its passage through the barrel.

And yet we find that the gun which imparts the greatest velocity and force to its projectile of which we have any account, is the Whitworth, which makes a complete turn in twenty inches !

Again—it has long been received as an axiom in gunnery, that in order to secure the full power of the expanding gas created by the explosion of the powder, it was necessary that the bullet should completely fill the caliber, and the astonishing results attained by the use of the minie bullet were owing to its perfect fulfilment of this condition. But it is now ascertained that this is true only at the outset of its course, and that when it has reached a certain point in the barrel, its velocity or power of penetration becomes greatly increased by

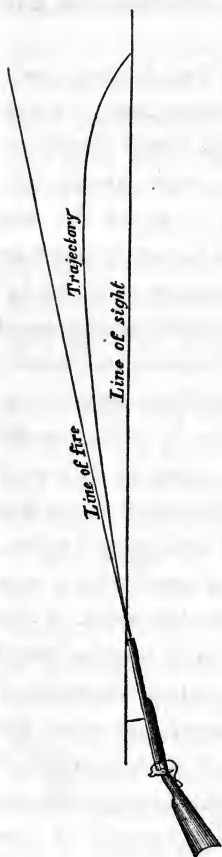
cutting out the alternate lands, so as to leave open spaces between the bullet and the barrel, and thus relieve the pressure of the column of air in front. In the study of the rifle, such experiences as these are of so frequent occurrence that I have invariably found that the men who have experimented most freely with it are the ones who have the least confidence in theories, and are most shy of laying down principles as established beyond question.

There are, however, certain laws to which all projectiles are subject, which it is vitally important that every man should know who attempts the practice of gunnery.

If a ball when shot from a gun proceeded directly on the course in which the gun was pointed, so as to produce simply a prolongation of the line of the axis of the barrel, nothing more would be necessary to insure the hitting of an object than to point the gun directly at it. In rifled guns the tendency to lateral variations is rendered comparatively trifling by the spinning motion imparted to the bullet, as I have already explained. Gravitation and atmospheric resistance, however, are constantly acting upon it; the former drawing it toward the earth with constantly increasing effect as its velocity is diminished by the action of the latter.

In its course, therefore, it describes precisely

such a curve as is seen in a stream of water thrown from the nozzle of a hose. From this it results



that, in order to hit any point within its range, it is necessary to direct the line of fire just so far above that point, as the trajectory or curved line described by the bullet would fall below it if aimed directly at it—as is shown in this figure, which represents the principle accurately, though it must be borne in mind that it is impossible, in a drawing of small size, to give even an approach to accurate proportions.

The point at which the trajectory intersects the line of sight, is called the “point blank,” and may be varied by elevating or depressing the after sight, which, as may be seen, would alter the angle of elevation of the gun, and with it that of the line of fire which is the prolongation of its axis.

Various modes of sighting the rifle have been adopted, which have their several advantages, de-



pendent upon the circumstances under which they are to be used, the object in all being the attainment of the utmost precision in directing the gun to the point to be shot at.

The telescope sight is only used upon very heavy rifles, to be fired from a dead rest. It consists of a telescope extending the whole length of the barrel, and furnished with cross threads like those of a theodolite, by means of which the aim may be fixed with mathematical certainty upon an object so small and at such a distance as to be invisible to the naked eye. It is elevated or depressed by means of a screw at the end nearest the breech, and gives a power of directing the course of the shot, which is utterly unattainable by other means, but which of course can only be adopted in a very limited degree for military service, and is useless to the sportsman. The "globe and peep" sights, consists of a small metallic disc, pierced with a very minute aperture, and fixed upon the stock of the gun by a screw or slide, by which it may be raised or lowered, and a bead or globe, upon the point of a slender steel wire on the barrel just over the muzzle, protected by a cylinder of steel, in which it is inclosed. The bead is sighted through the pin hole of the back sight, and being brought in line with the target, affords a very perfect means of directing the shot. But even this is too delicate an

arrangement for field service, and is rarely used except for target shooting, though commonly furnished with the equipments of a thoroughly finished rifle, to be made use of when required.

The most common arrangement consists of a bead or "knife edge," of bright metal, fixed on the top of the barrel just over the muzzle, and called the "foresight," and an "aftersight," or "guide sight," near the breech, which is constructed with a notch like the letter V, through which the foresight must be aligned with the target. If these sights are properly arranged so as to be in the same vertical plane with the axis of the barrel, the line of sight drawn through them should coincide precisely with that of the flight of the bullet, except so far as the latter is affected by external influences. It is rare, however, that the sights are arranged with perfect accuracy, as they come from the gun-maker's shop, but the error may be detected by a few experiments, and rectified by moving the foresight a little to one side or the other,—as it is commonly fixed upon a plate which is movable in a slot cut across the barrel.

The aftersight being so arranged that it may be raised or lowered, the proper degree of elevation of the line of fire for any distance within the range of the piece may be given, and the line of sight still directed exactly at the target. In order, however,

to render this power practically useful, it is necessary that the degrees of elevation for different distances be ascertained by actual trial, and marked upon the slide or screw of the sight, and also that the shooter should acquire the power of estimating distance by the eye, so that he may be able to tell by a glance at the object at which he wishes to shoot, the degree of elevation required. And the longer the range the more important it becomes to estimate exactly the distance, because at the end of a long flight the bullet is falling more rapidly, and describing a much shorter curve than at the beginning, and consequently the probability is much greater, either that it will fall short, or overshoot its mark than when it is moving more nearly in a horizontal direction. Another cause of difficulty in shooting accurately at long ranges is, the much greater variation which is given to the line of fire by a very slight inclination of the gun to one side or the other, owing to the increased elevation of the aftersight, which thus becomes the radius of a much larger circle. If it is not held perfectly true, therefore, or perpendicular to the horizon, the line of sight is no longer in the same vertical plane with the axis of the barrel, and the line of fire, instead of being merely elevated, is directed to one side, and however slight the variation, it becomes important in a long range.

Target shooting affords the only reliable means of attaining the art of using the rifle skilfully, and it ought to be commenced under an instructor, and after careful training in position and aiming drill. It is very common to hear from men who have made but little use of the rifle, an account of some extraordinary shot they have made which astonished everybody—themselves included ; but single shots prove nothing, and no experienced rifleman would cite them as proofs of skill, but only as curiosities, though in fact they often serve to establish a man's reputation.

Some twenty-five years ago I spent part of a winter in a lumber camp on the Penobscot, and one day killed a partridge at an extraordinary distance, a shot which I knew very well I might not have been able to repeat in fifty times firing. But that shot was told of among the lumbermen, far and near, as a proof of my skill, and a friend of mine told me he heard it recounted years afterward in a lumber camp, as a sample of Kentucky skill, the fact that I had a Kentucky rifle being taken as evidence that I was a Kentuckian. In those days, rifles were almost unknown in Maine, the lumbermen being generally provided with short shotguns, in which they fired buckshot or a single ball, the thick woods rendering it almost impossible ever to shoot at a long range ; besides this, the barbarous

practice prevailed of hunting deer in deep and crusted snow, when the poor creatures could not escape, and were butchered at close quarters.

The relative powers of shooters can only be proved by the average distance from the centre of a series of shots fired at a measured distance, and under the same circumstances of wind and weather, which exert an important influence, and demand a constant exercise of judgment. In a dry, hot day, the powder burns much more quickly, and consequently with more explosive power than on a cold, damp day, and the balls will hold up better in consequence.

Every gun, too, has its own characteristics, and it is the business of the owner to study its peculiarities, and the circumstances which affect its shooting, and be ready at all times to adapt himself to them. The first thing he has to do even before purchasing a gun, is to make sure that its capacity for accuracy is sufficient for his wants; for until he knows that the gun is reliable, he can never ascertain whether a miss is to be ascribed to the fault of himself or the gun. Having satisfied himself on this point, his work then is to train himself to develop its capacity to the utmost.

Long-range shooting involves certain necessities which comparatively few men can always command. In the first place it is a difficult matter in

a country which is thickly settled, and much intersected with roads, to find a place where it can be practised in safety, and it gives one a very disagreeable feeling to learn that his bullets have been heard whizzing about the ears of his neighbors. It is never safe to shoot into the side of a hill which is anything less than a perpendicular embankment. The bullets will rarely bury themselves, but will glance and fly off in the most unaccountable directions, and to an incredible distance. Then at very long ranges it is absolutely necessary to have some one to mark the target and point out the shots, and a telescope must be used to see where he points. If a proper place can be found, and a party go together who take turns in attending the target, or employ a person for the purpose, it is an exceedingly interesting exercise, but will not probably be extensively practised except by clubs or companies under military drill. The sportsman will rarely have occasion to shoot a greater distance than two hundred yards, and never so much as that except at large game, and the interest of target shooting, at that distance, at a ten-inch ring, is as keen as at a three-feet bull's eye at half a mile. For that distance it is not difficult to find a shooting ground where one can practise by himself in safety, and by having a large box filled with sand, with paper or pasteboard targets to be tacked against it, he may

stop every bullet, and at the end of a season's shooting find a good store of lead for recasting—a species of economy which, if he practises much, is by no means to be despised.

I hope to see the day, however, when such practice will be so common, that every community will have its established target ground, with every necessary arrangement for convenience and safety, and where any one, under proper restrictions and regulations, may be at liberty to practise or receive instruction. It is only by concerted action that the interest can be excited which the subject merits, and it is high time we were bestirring ourselves actively in the matter.

Our kinsmen across the water are very far in advance of us in this respect, as we shall learn to our cost if we ever find ourselves opposed to them ; and whoever reflects upon the experiences of the last two years, must be deficient in common sense if he fails to perceive the duty which is incumbent upon us, of developing our national strength by the encouragement of physical education, and a general familiarity with the use of arms.

## CHAPTER III.

### THE TARGET RIFLE REDUCED TO PRACTICAL USE.

It is obvious that the two most essential points in a rifle are precision and force. Unless it can be relied on within the limits of its range to place its balls within a certain space, it can of course inspire its owner with no confidence of power, and if its range is not sufficient for the utmost demand he may have occasion to make upon it, he will soon become dissatisfied and impatient of the consciousness that he cannot rely upon it for game, or cope with an enemy who is provided with a more efficient weapon. But the utmost possible perfection in these two points, is only to be attained by the construction of such a gun as is utterly useless for field service, on account of its weight and necessary equipments; and the grand problem to be solved in gun manufacture is, to ascertain the greatest degree of accuracy and force it is possible to attain, consistently with the other essential requisites for its easy manipulation and use.



In considering this question it may first be remarked, that very different degrees of accuracy are required for different purposes.

In military service occasions may often arise when the value of trained sharpshooters, armed with the best rifles that can\* be made, can hardly be overestimated, while for troops of the line, amid the smoke and dust of battle, precision of shooting is unattainable, except so far as consists in giving the proper elevation,—or rather depression, for in most cases the fault lies in overshooting. It is for military men of long and varied experience to decide whether the advantage to be derived from the occasional almost invaluable services of men armed and accustomed to the use of such guns as are only available in rifle pits, as a species of light artillery, are sufficient to balance the objections arising from a variety of arms, and the fact that in ordinary service such weapons are useless.

For the sportsman a much greater degree of accuracy is desirable than for the soldier; yet even with him, the different objects in view and the different tastes of individuals, admit of considerable latitude, and demand the exercise of judgment in the selection of a weapon.

The man who seeks only the amusement of shooting small game, requires simply a gun which is reliable for hitting a very small mark at thirty

or forty yards, and will be satisfied with a light gun of very small caliber. Such a weapon furnishes pretty sport for ladies, and is useful in teaching boys, but its use is hardly worthy the name of rifle shooting.

The sportsman who adopts the rifle as his weapon, should be satisfied only with such game as is worthy of its powers, and is to be found only in the forest or on the prairie, remote from civilization; and although every man who uses a rifle is desirous of course to be able to place his shots as accurately as possible in the spot he aims at, yet for the deer, the moose, the bear or the buffalo, it is obvious that no such minute accuracy is required as for barking squirrels, or picking off the heads of partridges. It is rare that an opportunity offers for shooting at a deer at so long a range as two hundred yards, and by far the greater number of shots—at least in the woods—are made at less than half that distance. If one were offered his choice, therefore, between the best single-barrelled muzzle-loading rifle, capable of placing every shot within a two-inch ring at one hundred yards, and a repeater, capable of shooting several shots in succession, but not reliable for that distance for a smaller mark than a circle of six inches, I should consider him very finical in his tastes if he selected the former; for the other is certainly sufficiently accurate for

his purpose, (as any one may see by describing a circle of six inches diameter on the side of a deer with its centre over the heart,) and the very great advantage it possesses in its reserved shots, in case of coming upon a herd, or wounding an animal which might escape or prove dangerous, is more than a compensation for the difference I have supposed to exist between their powers of shooting, for I would not have it understood that I admit such a difference as necessarily existing.

The conditions whose observance is essential to the utmost perfection of accuracy and power, are more rigidly adhered to in the construction of the American Target Rifle than in any other which has yet been produced, and their fulfilment has resulted in a weapon which, *in these qualities*, has never been, and probably never can be, surpassed. These conditions are : first, an enormous weight of barrel, admitting the use of so heavy a charge of powder as to impart the greatest possible initial velocity to the ball, without any serious recoil ; second, the gaining twist, which is absolutely essential to prevent stripping when so heavy a charge is used ; third, the patent muzzle for loading, which, with the help of the "starter," insures the accurate insertion and true delivery of the picket ; and, finally, the telescope sight, which renders the aim mathematically exact. The weapon thus constructed,

weighing from twenty-five to fifty pounds, and using a flat ended picket of hammered lead, carefully swedged and seated upon a linen patch, constitutes a species of light artillery, whose value, under certain circumstances, as has been abundantly proved during the present war, is inestimable, but whose only possible use, except in such cases, is as an instrument for testing, by experiment, the degree of precision and force, or range which it is within our power to attain. It may be taken as the unit of perfection in accuracy and power; the starting point from which to proceed in the effort to produce an available weapon for actual service; or rather as the goal toward whose attainment, consistently with other essential requisites, those efforts should be directed.

Considering it in this light, I propose now to examine the features to which it owes its superiority, and endeavor to ascertain how nearly the necessities of actual service will permit us to approach them.

It is obvious, at once, that the telescope is inadmissible in a rifle for field service, as it renders the weapon too unwieldy, besides being too delicate an instrument for the exposure and rough usage to which it must of necessity be sometimes subjected. This reduces us to the necessity of using open sights, of which the globe and peep sights are the nearest approach to the telescope. But even these require

too much care in their adjustment and use to be available, either for the soldier or the sportsman, and we come next to the simple bead and V sights, which, with slight modifications, have been universally adopted for military and sporting rifles. No one who has not tried the experiment of aiming at a distant object with the telescope, and then with open sights, can realize how great a loss of power is involved in this change. At a distance of half a mile, the intersecting lines of the cross threads in the telescope may be easily fixed upon a spot two inches in diameter, and a variation of half an inch, either vertically or horizontally, may be instantly detected.

With open sights at the same distance, a bull's eye, three feet in diameter, is completely covered by the bead, and a variation of a foot one way or the other is hardly perceptible.

Supposing, therefore, that the same rifle is used in each case, and that its shooting is perfectly accurate, it is obvious that, with the telescope, the shots may be directed with a degree of precision absolutely unattainable with the naked eye and open sights.

It is impossible, of course, at any distance, to do better than place the shots within the space which is covered by the sights.

Thus, at two hundred yards, the bead of the

globe sight, when seen through the aperture of the peep sight, completely fills a ring or bull's eye of nine inches diameter, so that every shot which hits within that ring, has done its duty to the best of its ability, being within the limits of the smallest point to which it was possible to direct it with such sights. Yet this would allow a margin of four and a half inches in either direction from the centre, while with the telescope at the same distance the sight may be taken at a spot of half an inch in diameter, which would be invisible to the naked eye, and a corresponding precision of shooting may be attained.

It results, then, from the substitution of open sights for the telescope, that at the distance of half a mile, which is less than half the distance at which the rifle shot is easily fatal, the attainable precision is reduced by the mere loss of power in aiming or directing the shots, in the proportion which three feet bears to two inches. In other words, the chance of hitting a two-inch spot when the telescope is used, is as good as that of hitting a three-foot ring with open sights. Now, in many cases, this is of no practical importance, as for instance, between bodies of infantry, who would always be brought into action with each other at closer quarters, and who are not expected in such case to do more than give the right degree of elevation, with-

out aiming at individual objects. But the annals of warfare furnish abundant evidence that cases frequently occur in which the importance of such power can hardly be estimated.

The instance which occurred at Balaklava, as mentioned in Lord Raglan's despatches, is a case in point, and may serve as an illustration.

A Lieutenant Godfrey, having<sup>d</sup> approached a Russian two-gun battery, under cover of a ravine, within six hundred yards, and having his men hand him their rifles in succession, actually picked off the artillerymen in succession, till there were not enough left to serve the guns.

This is justly cited as a proof not only of the possible value of good marksmanship, but of the excellence of the weapons with which it was performed, which were Enfield rifles. With the target rifle and telescope sights it could have been more easily and certainly performed at twice the distance, as has been repeatedly proved in our own service and in target shooting. Six hundred yards is but little more than a third of a mile; a distance at which the common military rifle would be of little value, except in the hands of a first rate marksman, as Lieutenant Godfrey proved himself to be. General Jacobs mentions, as a remarkable proof of the power of one of his rifles, that "a good shot could put nearly every ball into a circle of eight feet

diameter at one thousand yards," which is but little more than half a mile. With the target rifle and telescope sights, the feat has repeatedly been performed of firing a series of shots *without a single miss* into a flour barrel at three quarters of a mile, and at Yorktown the "Andrews Sharpshooters," armed with these rifles, in repeated instances held the enemy's batteries silent, till counter works were established which could not have been erected but for their aid. On one occasion a party of our men working in the trenches were annoyed by a sharpshooter who had posted himself in a tree eight hundred yards distant, from which he could make their position an uncomfortable one, while it was impossible at that distance even to distinguish him with the naked eye among the branches of the tree. Two of the Andrews Sharpshooters were placed in the trench, a telescope sight was fixed upon him, and the first shot brought him down; and this is but one of a multitude of anecdotes which have reached me of the same tenor.

The removal of the telescope does not, of course, affect the shooting of the gun, but only the power of directing the shots. The next change which we find necessary, however, in reducing its equipments to practical form, affects directly its precision. This is the abandonment of the patent muzzle, which is inadmissible for the soldier, and almost equally so



for the sportsman ; and yet for a muzzle loading gun it is absolutely essential, to insure the perfect centring and true entry into the barrel of the conical or elongated shot. It consists of a piece of the barrel itself, an inch or so in length, which is sawed square off at the end, after the rifles are cut, and is so arranged as to be exactly replaced and held in position by four steel pins, while loading, and then must be removed when the gun is fired. The muzzle of this piece is cut bevelling, so that the bullet may enter it without cutting the patch, and may then be pushed down with the "starter" into the barrel beyond the line of intersection. The false muzzle being removed after the gun is loaded, it is obvious that the bullet will be delivered, when fired, from a perfectly square cut muzzle, involving a much greater certainty of true delivery than if it comes out of a bevelled muzzle, the importance of which may be understood by reflecting upon the effect which must ensue, if the ball comes out canted to one side so as to admit an uneven escape of the gas which propels it. The "starter" is an instrument of brass, consisting of a tube which fits exactly and firmly over the end of the barrel, or false muzzle, and through which slides a piston which is hollowed at the end to receive the point of the bullet, and is centred to correspond exactly with the bore of the gun, so that when fixed

in position, it insures a mathematical coincidence of the axis of the bullet with that of the bore, compared with which, any possible precision which can be attained by the eye is mere guesswork, and the best performance of the expanding bullets used in military rifles is comparatively rude and barbarous. In breech-loading guns the necessity of bevelling the muzzle does not of course exist, and the Maynard rifle owes its precision to the care which has been taken to insure the perfectly true delivery of the bullet from the cartridge into the caliber, as explained in the description of that gun.

The false muzzle and starter together weigh a pound or two, and are altogether too clumsy and awkward appendages for field service.

Having thus stripped the gun of the external equipments which are obviously inadmissible for the soldier's use, we now find it necessary to reduce its weight to such a standard as will be easily portable for a man of average strength, in addition to his other necessary equipments for the march.

Experience has fixed this standard at about ten pounds, a reduction which immediately affects the capacity of the weapon, by changing the relative condition of the elements on which its performance depends. If the caliber is also reduced proportionally, we may still preserve the same, or nearly the same ratio of weight between the gun and its pro-

jectile, as is seen in our best American sporting rifles, in which the thickness of the barrel is equal to the diameter of the bore, and the gauge for a ten-pound gun is about ninety.

With such a weapon the accuracy may still be preserved, but the range is at once reduced, even if such a charge is used as to insure the same initial velocity. Beyond a range of three or four hundred yards, no dependence can be placed upon so light a projectile, while its power of inflicting a severe or fatal wound is reduced in a still greater ratio by its loss of size, as well as weight and consequent momentum. For military use it is not wise to reduce the weight of the projectile to less than one ounce, which is about the average weight which has been adopted by all nations after the most careful experiments.

It will now be seen that the final results of the changes which have been indicated (and every one of which was absolutely necessary), is the production of a weapon whose form, weight and equipment, are represented by the Springfield rifle, which may indeed be taken as a perfect model of a muzzle-loading soldier's gun, and as the nearest approach which can be made to perfection of power and accuracy, consistently with the other indispensable conditions of a weapon for military service. The alterations which have been described, however,

render it necessary to make further changes of the conditions which affect its performance. With such reduced weight of the gun, without a corresponding reduction of the ball, it becomes necessary to diminish the charge, as otherwise the recoil would be greater than could be borne.

The effect of this is to reduce the initial velocity to such a degree that there is no longer a necessity for the gaining twist, as the projectile does not strip, even if started from the breech with a turn sufficient to keep it spinning to the end of its flight. Herein may be found the explanation of the differences of opinion which prevail in regard to the value of the gaining twist.

Our best rifle makers and target shooters insist upon the gaining twist as absolutely essential to the best shooting, while the experiments of military men in Europe and in this country go to prove that no perceptible benefit results from the gaining over the even twist, and an experienced gunmaker asserts that he has tried the experiment of reversing a barrel which had been cut with a gain twist, breeching the muzzle and making a muzzle of the breech, without any perceptible effect upon its accuracy. Now the object of the twist is solely to impart a rotary motion to the ball, and no greater twist should in any case be given than will suffice to keep it spinning to the end of its flight. If this

can be done with an even twist, (and experience proves that it can with the ordinary charge used by the soldier,) nothing will be gained by altering it. But with the enormous charges used in the target rifles, if the grooves started with as sharp a turn as that with which they terminate, the ball would strip, or in other words be driven straight through the barrel without acquiring the rotary motion, which could only be given to it, while moving with such velocity, by the gradually increasing guidance of the gaining twist.

I have mentioned the American sporting rifle as preserving more nearly than any other the relative proportions of weight of barrel and projectile which are observed in the target rifle. This gives a gauge of about ninety for a ten-pound barrel, and to the extent of its range, such a gun, if properly made and properly used, will do as nice work as anything that can be produced, excepting that in a high wind it is of course more affected than a heavier shot. And the range of such a gun is sufficient for the ordinary purposes of a sportsman, but the objection to it lies in the fact that the wound inflicted by so small a ball is not sufficient to destroy life, or even to cause serious detriment to a large animal, unless placed directly in the brain or heart. The English officers in the Crimea used to complain of the small caliber of the Colt's

pistols which were then in use, that an enemy might receive a death wound from one of them, and yet live long enough after it to kill his antagonist ; and so a deer or moose may receive a mortal injury from one of these rifles, and yet be able to carry it far enough to make his escape before death overtakes him, while the mere shock of so terrible a blow as is inflicted by an ounce ball is enough to paralyze the vital functions even when the position of the wound is not such as to render it necessarily mortal. I have known a deer to run two miles with two ninety-gauge balls in his flank, one of which had broken the thigh bone ; and another to get clean off with a ball of the same size, which (as could be plainly seen by the blood on his side) must have been within an inch or two of his heart. With a ball of sufficient size this could not have happened. For deer shooting, however, I think no man who knows the use of his weapon need use a larger caliber than a fifty-gauge, which uses a picket of about half an ounce, and makes much cleaner work than one of an ounce, but for bears or any game which may give trouble when wounded, I should prefer a larger caliber, unless the gun is a repeater.

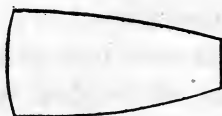
One of the most reliable targetmen of my acquaintance, has expressed to me his conviction that it was impossible to attain the full capacity of

range and accuracy of a fifty-gauge telescope rifle with less weight of barrel than twenty-five pounds.

A great many riflemakers object to large calibers and heavy balls, and endeavor to dissuade a purchaser who has conceived a fancy for such an instrument, and tries to induce them to construct it. They insist upon the impossibility of doing as nice work with such a gun as with one of smaller caliber, and deride the argument of the necessity of heavy balls for long range shooting. Notwithstanding these assertions, the fact is incontrovertible, that a small ball is not reliable for a long range, and a gun with large caliber may be made to shoot equally well at long or short ranges. The men who understand the construction of such a gun, however, are not common, and the task is one of such difficulty that it is not surprising that few are willing to undertake it.

A consideration of some of the principles on which the target rifle is dependent for its accuracy, will enable us to understand the reason of this difficulty. I have elsewhere stated that one of the conditions of primary importance for the attainment of this result, is its power to use so large a charge of powder as to insure the greatest possible initial velocity, and that with such a charge and such velocity it was impossible to prevent "stripping," except by means of the gaining twist. With a

heavy ball this tendency is very greatly increased, and it is found exceedingly difficult, in shooting a bullet weighing an ounce, to give it a degree of velocity proportionate to that attained with one of half that weight or less, without so cutting and displacing the patch and deforming the ball as materially to affect its accuracy. A target rifle of ninety gauge uses about the same charge of powder as the military rifle with an ounce ball, and most gunsmiths insist upon it that if a target rifle is made with a caliber large enough for an ounce ball, and loaded with a charge of powder proportionate to that used for those of small caliber, the patch and ball will be inevitably torn and damaged, and no good shooting can be done with it. If this were true, the chief object of telescope rifles (that of shooting with reliable accuracy at objects entirely beyond the reach of anything like probability with ordinary sights) would be defeated. That it is not true, however, has been proved by the performance of rifles manufactured by J. F. Brown, of Haverhill, Mass., and also by Mr. William B. Farrington, of Concord, N. H.



The above is an exact representation of a bullet



weighing 577 grains, or  $1\frac{1}{2}$  ounce, and used in a target rifle of Mr. Brown's make, with a caliber of  $\cdot 54$  of an inch.

The three targets here represented, were shot by Mr. Alvah Merrill, of Haverhill, with one of Mr. Brown's guns of this caliber, at a distance of 40 rods, or 220 yards, and I have selected them to illustrate some interesting points in connection with the subject of target shooting.\*

The gun with which these targets were shot, weighs forty-two pounds. The charge for it fills  $2\frac{1}{2}$  inches of the caliber, and weighs 134 grains.

The rifle is cut with a gaining twist, starting with one turn in five feet, and ending with one in three feet, but with this peculiarity, that the full degree of twist is attained before reaching the muzzle, and the last two inches maintain an even turn, which is thought to impart a steadier motion than when the gaining twist is carried clear to the muzzle.

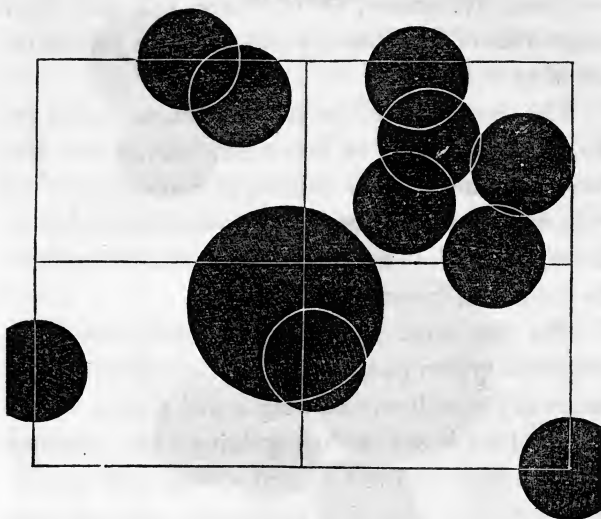
I saw these targets shot myself. The day was cloudy and rather damp, with a light southeast wind quartering against the line of fire from left to right.

No. 1 was shot with balls cast and swedged, but the lead not hammered.

No. 2 was shot with balls of hammered lead. These two strings, of ten shots each, will be ac-

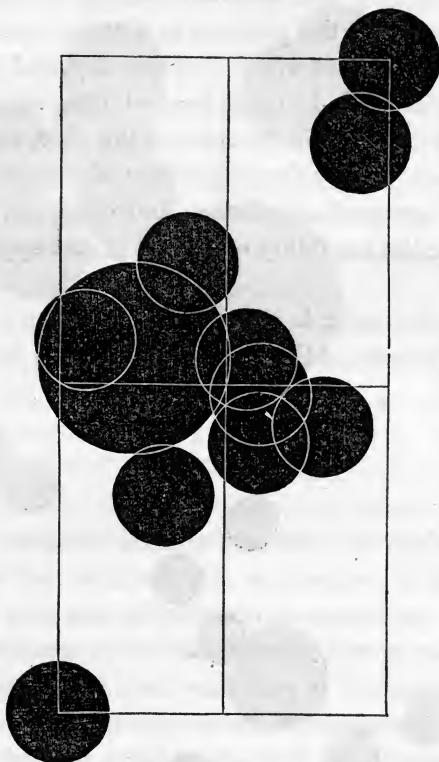
\* The cross lines on targets No. 1 and 2 were drawn merely to show the mean point of impact, or central point of all the shots.

TARGET No. 1.



knowledge by any experienced rifleman to be equal to the capacity of any gun that can be produced. In fact, if we consider the case with a little attention, it will be seen that such precision is a nearer approach to perfection than is often attained by any instrument of human manufacture. For if we represent the distance of forty rods by a line four feet long, (which is a very large scale,) and then attempt to indicate on the same scale the variation of one inch, (which is about the average error of these shots,) it will be found that it will hardly make a perceptible increase of the thickness of a fine pen line, so that in reality it would be very

TARGET No. 2.



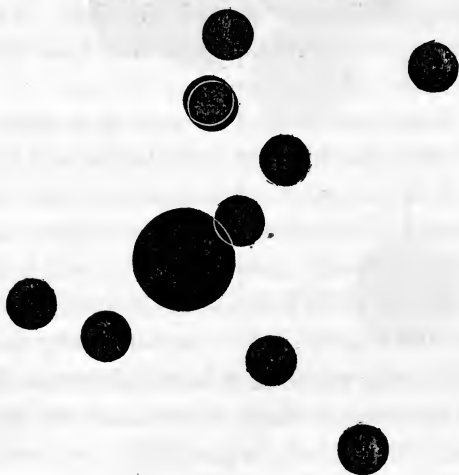
difficult to draw a line of that length with a ruler, without making a greater proportionate divergence than that of an inch in forty rods.

It will be observed that three of the shots in this target are separated from the group in which the others are clustered. Such variation may be

attributed to a flaw of wind meeting the ball in its flight, or to the presence of dirt in the barrel. If the barrel is not wiped perfectly dry, and grains of powder stick to the sides and clog under the patch, the effect will be seen in the shot, and this fact shows plainly the importance of always keeping the bore perfectly cleaned and oiled, and never suffering the possibility of a speck of rust appearing upon it.

But the reader is perhaps curious to know why I have introduced the target No. 3, which is so far

TARGET No 3. (REDUCED ONE HALF.)



inferior to the others, measuring a string of  $17\frac{1}{2}$  inches, and the shots lying all around the centre.

(The cut represents the target reduced one half.) My reason for doing so is that it illustrates very strikingly, the importance of attending to the minutest details of arrangement. After shooting the first two targets, it was found that no more patches were at hand of the proper size for such a bullet, and others were substituted which were much smaller, and in fact folded but little way above the base instead of extending for half the length of the bullet. The result was predicted and immediately verified, for all the three were shot in immediate succession, and there was no other perceptible cause for such an effect. I examined many of the patches which had been fired, but found none which had been cut or torn.

From these facts it may be seen how slight a thing will affect the flight of a rifle bullet, and how essential it is to good marksmanship that the shooter should be familiar with his weapon, and with all the niceties of arrangement by which the utmost perfection of its performance is attained.

On the 30th of June, 1863, a match of fifty shots each, at forty rods was shot at Lowell, between Mr. Merrill, using the gun above named, and Mr. Farrington, of Concord, using a gun of his own make of a slightly larger caliber. The bullet, however, being shorter than that used by Merrill, was but one and a half grain heavier.

It was a very bad day for shooting, the wind blowing in violent gusts, and shifting its course continually. The match was won by Farrington, whose fifty shots measured  $73\frac{1}{8}$  inches, to Merrill's  $77\frac{1}{8}$ ; the average in each case being very nearly one and a half inches from the centre, Farrington's being a little less, and Merrill's a little more than that.

But the grand point proved by such shooting, is that it is possible to do as nice work with these heavy bullets at forty rods, as with one of a ninety gauge, and as a consequence that we have here a reliable weapon to the extent of its range which we know to be considerably more than a mile.

From reports of the Ordnance Department, I find the average variation of the Springfield Rifle at two hundred yards, when fired from a fixed rest, is about five and a half inches, and it will be seen that the difference between this and that of the target rifle is enough in a range of half a mile, to give to the latter all the advantage I have claimed for it.

The refinement of accuracy, however, which is attainable with the best target rifles, is the result not only of the construction of the instrument with which it is performed, but of the most careful attention to minute details in the whole process of its management.

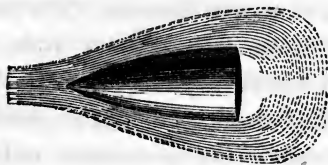
The bullets or pickets should be made of lead

which has first been hammered or rolled and then swedged into shape in a steel die without being melted. If we take a common bullet as it comes from the mould, and swedge it and then put it in a vice, and compress it to half its length, it will be found to be covered on its sides with little projections or blisters, but if we take another and hammer it on all sides for a few minutes, and then swedge it into shape and repeat the process of compressing it in the vice, it will retain its smoothness of surface undisturbed. Now, in being shot from the gun, the bullet undergoes a process similar to that of being compressed in the vice. It first receives a violent blow on its base from the explosion which tends to compress it, and during its passage through the barrel, the resistance of the air in front tends still further to the same effect, producing what is called the "upsetting" or jamming together of the ball. By the process of hammering the tendency to upset is much reduced, and in whatever degree it may take place, there will be no roughness of the sides to affect its accuracy by atmospheric friction. There is little doubt that the process of upsetting the ball is due chiefly to its compression between the column of air in front, and the expanding gas in its rear, and as this pressure is constantly increasing during its passage from breech to muzzle, the ball is becoming more and more

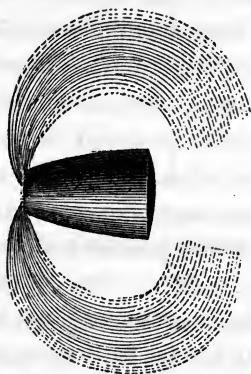
deformed as it moves forward. The fact that the bullets fired from the Atwater Rifle (elsewhere described), invariably preserve their shape uninjured, affords, I think, convincing proof that such is the case, and seems to promise relief from an obstacle which has hitherto been thought insurmountable.

The shape of the bullet is a subject which has occupied the time and attention of scientific men to a degree which must excite the astonishment of one who has no knowledge of the difficulties attending it. With our target riflemen, the flat ended picket, with its base slightly rounded, is the form which is universally accepted as the best for accuracy. Various theories have been suggested to account for the undoubted fact of the greater accuracy of flat ended than of pointed bullets. One of the most recent, and, to my mind, satisfactory explanations of it, was suggested to me by Dr. Maynard (the inventor of the Maynard Rifle), with whom it originated. This is that the air in front, being driven from its position in a direction at right angles with the course of the bullet, does not again unite till the bullet has passed through the vacuum thus formed, and is thus relieved from the atmospheric friction against its sides, which no doubt affects it materially. The following illustrations may serve to explain the idea more clearly. This theory accords





with the latest received explanation of the phenomenon known as drift, or derivation, which is the ten-



dency of the bullet in a long flight, to diverge toward the side to which the twist of the rifle inclines,—that is to the left, when the twist is from right to left, and *vice versa*. General Jacobs asserts, confidently, that there is no such tendency, but the experiments of French officers seem to leave no room to doubt its existence, and the most rational explanation of it is the one to which I

allude, that the action of gravitation causes so much greater atmospheric friction on the under than the upper side of the bullet as to cause the divergence.

The patch must be of the finest linen, and used with the glazed side next the barrel, and in order to insure its folding evenly and without a wrinkle about the bullet, it should be cut with a steel punch in this shape :



A circle is marked around the muzzle corresponding in size to the circumference of the patch; which (having been previously wet with saliva) is laid on so as to coincide with it, thus insuring the exact centring of bullet and patch on the muzzle, and the "starter" being then applied to the bullet, it is driven down some two inches to the point at which the "freeing" of the barrel begins. The starter and false muzzle are then removed, and the rammer being inserted, the bullet is slid gently down till it touches the powder, when the rammer is withdrawn, care being always taken to avoid pressure upon the powder.

After every shot the gun is carefully swabbed, first with a wet and then with a dry rag, and in shooting, the most careful attention is paid to the influence of wind and sun.

From the statement which has been made of the conditions on which the target rifle is dependent for its superiority in precision and force, and from the manner in which it has been shown that those conditions must be modified to render the weapon available for active service, it may be presumed that the reader will now be able to judge for himself how nearly they have been fulfilled, in any given case which he may be called upon to decide.

These conditions are of universal application, and any arrangement of the working parts which in any way operates to hinder their fulfilment is in so far objectionable.

It must not be supposed, however, that any gun is to be relied upon merely because no fault is to be found with its appearance. I am now speaking of course of such a gun as one would purchase for target shooting or sporting purposes, (and not merely for military service,) and as I have just been setting forth the merits and powers of the heavy target rifle with telescope sights, I do not like to leave the subject without expressing my conviction that the grand object of rifle practice, that of training men to the ready and skilful use of the weapon

in the field, is in no wise promoted by the use of such unwieldy instruments, requiring a dead rest or such external equipments as must always be abandoned in active service. As an instrument for testing the possible powers of the rifle, such a weapon is invaluable, and the experimental proofs of its powers are exceedingly interesting and important, but the object of rifle practice being to fit men to make a ready and skilful use of the weapon in the field, no guns should be used in target practice which are not available for such purpose, and no rest should be allowed.

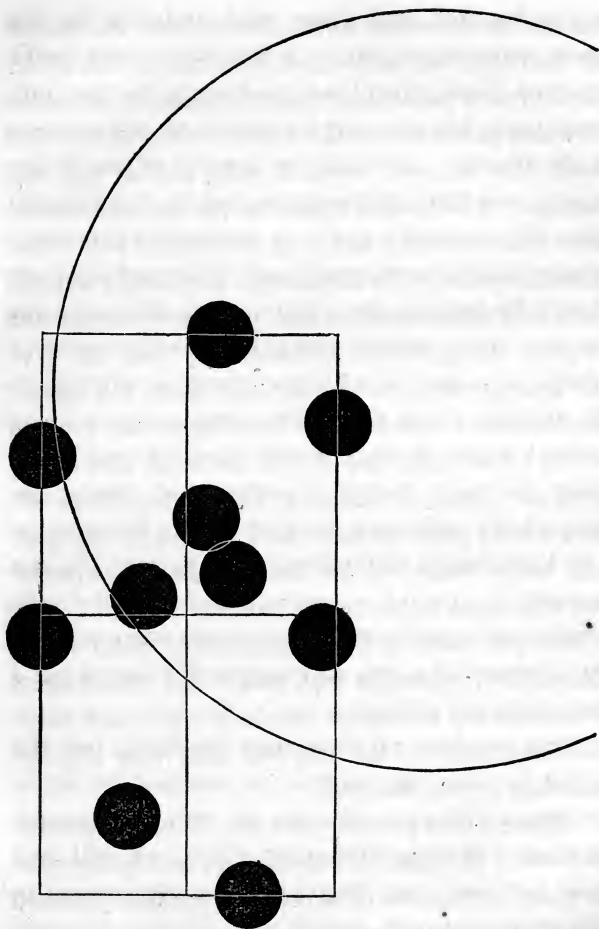
Before purchasing a gun, then, a careful examination should be made of its construction and finish, and the working of all its parts. If, however, it comes from a reliable maker, his warrant should be sufficient to insure thorough workmanship, and the buyer need only assure himself that its weight is suitable to his strength, its caliber to the work for which he wants it, its general appearance in accordance with his taste, and the stock of such length and shape as to fit his arm, neck, and shoulder. And this last can only be learned by trying different guns till the difference is perceived and the easiest form discovered. To attempt instruction would be like trying to give directions for fitting a boot, which every man can best learn by experience. The balance of a gun, however, is an

important point which might not be readily apparent to a novice, and merits especial notice. If the muzzle is disproportionately heavy, it will be found much more difficult to hold the piece to a steady aim (particularly with a long barrel), than if the weight is near the breech, for the same reason that if the blade of an axe is held in the hand with the helve pointing forward, it may be held much more steadily than if it is reversed, and the blade held out at the extremity of the helve.

Having made the selection so far as can be done by such examination and trial, the proof still remains to be made of its shooting, and for this I would take no guarantee short of actual trial by a competent person. For this purpose a dead rest should be prepared in such a manner that the barrel of the gun may lie upon a perfectly inelastic substance, like a bag of sand, while the elbows (or at least the right one) also are supported on the stand or table which forms the rest. This stand should be perfectly solid and firm, and the shooter should be seated by its side, with his right breast resting against it. The trial may be made at whatever distance he has been most accustomed to shoot, but for the mere question of accuracy, one hundred yards is as good as any greater distance, leaving the range for future consideration. The finest sights with which the weapon is provided, should of

course be used, and these will probably be the globe and peep sights. A four-inch white bull's eye on a black ground is a good target for one hundred yards, but this may be varied to suit the eye of the shooter. It should be as small as can be distinctly seen through the sights, and the bead should just fill the bull's eye. A perfectly calm atmosphere should be selected, and if the sun shines, it should be behind the shooter, and full upon the target. As a general thing I prefer the hours of sunrise or sunset on a calm morning or evening to the middle of the day. The arrangements being made, a series of shots should be fired, using precisely the same charge of powder, and aiming exactly at the bull's eye at every shot. Knowing as I do the strength of the temptation to vary the aim to meet the error of a previous shot, I do not trust myself, and would not advise another when proving the accuracy of a gun, to examine the target till I have fired my string.

Any number of shots may be fired, but the object in view may as well be attained by an experienced rifleman with ten as with any greater number. Having fired your string, we will suppose you find your target to be as represented in the annexed figure, and if your distance was one hundred yards, you will have no cause to be ashamed of it. It must be borne in mind that all



we are trying to do now is, to ascertain the capacity of the gun, and we find on examination that all

but one of the shots have struck below the centre of the bull's eye, and all of them to the left of it. Next draw a parallelogram as represented, the sides of which pass through the centres of the shot which mark the extremes on each side, and at top and bottom. Divide this figure in its centre, horizontally and vertically, and from the central point thus formed, measure the distance to the centre of each shot, add them together, and you have the amount of your string, which, if divided by ten, will give the average distance of your shots from the centre. In this case the string is 9·7 inches, or an average of ·97 of an inch, and it will be found that a ring of three inches in diameter will enclose them all, which is as good as need be expected of any gun, and better than will be done in nine cases out of ten with open sights at one hundred yards.

Now, in order to bring this central point of the line of fire to coincide with that of the line of sight, it is necessary to elevate the back sight, and move the front sight to the left, but both very slightly, and then repeat the trial.

Having thus proved your gun, if you hope ever to deserve the name of rifleman, do not be tempted to make further use of a rest, but confine yourself strictly to off-hand practice.

I speak feelingly on this point, from having suffered such loss of power as I fear I shall never



be able to regain. In my sporting days I never used a rest, and yet I never had a doubt of securing my game at any reasonable range ; but for the last two years I have been mainly engaged in experimenting with different kinds of guns, for which purpose I have always used a dead rest, and I now feel literally lost when I undertake off-hand shooting, and can feel no confidence of placing my shots in the target with any tolerable accuracy.

## CHAPTER IV.

### PROJECTILE FORCE.

THE customary mode of testing the projectile force of a gun is by shooting at a series of boards, placed parallel with each other, and finding how many are penetrated by the shot. This is, perhaps, as fair a test as could be devised, but unless the experiment is conducted with care, it may be liable to great inaccuracy. It is no test of a gun to take it by itself and try its power of penetration, and then compare it with the record of what other guns have done at other times ; for, even if the targets be of the same kind of wood, the difference of their consistency owing to being coarse or fine grained, or perhaps merely from one being more seasoned than the other, would make an essential difference in the penetration. Then, again, the atmospheric influence on the projectile force of gunpowder is very different at different times. I once tried the comparative powers of penetration of two guns, on

a bright, dry day, with the thermometer at  $92^{\circ}$ , and found that one of them penetrated eight, and the other nine, inch boards of seasoned pine. The next day was raw and damp, with an east wind, and the thermometer at  $60^{\circ}$ , and on trying the same guns in the same target, I found the difference of penetration the same as before, but the penetration of each was an inch less, the one which had shot through nine giving only eight inches, and the other seven, and the report was so much lighter, that if I had not measured the charge myself, I should have supposed it much less than the day before.\* In order to test the power of any gun therefore, it should be tried with some other whose powers are well known, and both of them shot at the same time and into the same target. The record of the two should then be stated together, and it will be a fair statement of

\* From numerous experiments which I have made since the preceding was written, I am satisfied that the explosive power of gunpowder is very materially diminished by extreme degrees of cold, independent of the degree of atmospheric humidity. In shooting 200 yards on a perfectly clear dry day, with the thermometer near zero, with my sights arranged at the height I had marked for that range in summer, the shots invariably fell from eight to twelve inches below the mark. I have never seen this fact noted elsewhere, and can only refer it to the theory that the powder is then less combustible, as is the case with alcohol, which lights almost with an explosion in warm weather, but in a cold day I have sometimes burnt a whole match on its surface without igniting it.

their relative power. If I had tried the one of the above-named guns which gave the greatest penetration on the first day, and the other on the second, I should have found a difference of two inches in their powers. If I had tried the weaker one first, and the other on the next day, I should have found them equal. But other elements than those I have named enter into the question and must not be overlooked. Every schoolboy knows that momentum is proportionate to the weight and velocity of the moving object.

A two-pound weight moving twenty feet in a second has the same momentum, or in other words would strike any object with which it came in contact with the same force as a one-pound weight moving forty feet in a second and so on. The natural application of this principle to projectiles would lead us to suppose that increased power must necessarily result from increased weight of the projectile, provided the charge of powder was increased in the same ratio. But such is not the case unless the proportionate weight of the gun to the ball is also preserved.

The gun which gave the greatest penetration in the experiment described above, used precisely one fourth less weight of powder and lead than the other; but the gun itself weighed one third more, and the loss of power by the recoil of the lighter

gun was more than enough to counterbalance the gain from its increased charge.

Another fact may be mentioned in this connection as showing the liability to error in the application of principles to practice. It would seem at first thought that increased velocity would insure increased range to any attainable degree, and I find that most people take it for granted that such is the case, and conceive it to be a matter of course that increasing the charge of powder will increase the range of the ball to as great an extent as the experiment can be carried. Such, however, is not the case; for, although the initial velocity and consequent momentum of the shot may be thus increased, yet the atmospheric resistance increases in so much more rapid ratio that beyond a certain point it is impossible to attain by such means any increase of range. To illustrate the principle by a familiar experiment;—if we take a lath and strike a gentle blow with its flat side upon the water, the resistance will be trifling, and it will be found to penetrate the water easily. If, however, we strike a very hard blow, that is, with as much velocity as possible, we shall find that notwithstanding the great increase of momentum that of the resistance is still greater, and instead of passing through the water, the lath will be broken as if it had been struck against some hard substance. The resistance increases in the ratio of

the square of the velocity. A certain amount of water must be displaced to admit the passage of the lath, and if a certain degree of force is required to move it in a given time, it will take four times as much to move it in half the time,—sixteen times as much in a fourth, and so on,—and the point is soon reached at which the resistance balances or overcomes the momentum.

The following experiment affords a still further illustration of the same principle, and enables us to form a conception of the enormous power of resistance, which may be created by greatly increased velocity :—I filled a common butter firkin with water to the depth of 13 inches ; and placing it under a window, fired a ball weighing 265 grains, with a charge of 38 grains of powder, perpendicularly down into it—the muzzle of the gun being some seven or eight feet above the water. The ball was turned a good deal out of its course in passing through the water, as it was fired directly at the centre, but struck and split one of the staves within an inch of the bottom, and passed through the bottom just where it joined the side. It was found in the gravel below jammed entirely out of shape, and on examination with a magnifying glass, it was easy to see that its deformity was mainly the result of its contact with the gravel.

It was evident, therefore, that after passing through 13 inches of water it still retained a very

considerable power of penetration, as it had passed through the bottom of the tub and jammed itself into a shapeless mass in the gravel below.

I next took a rifle of smaller caliber, the ball weighing 165 grains, and loaded it with 70 grains of powder, thus insuring the very great increase of velocity which must result from using nearly double the charge of powder to very much less weight of lead. The effect afforded evident proof of greatly increased momentum, and yet the penetration was less than before, for the bottom of the tub, instead of being pierced, was but very slightly indented, but the ball itself was completely flattened; and the three ash hoops, which bound the tub, were instantly broken, and the staves were thrown apart as if by a violent explosion. Here, then, is evidence, that if we attain a greater momentum by means of an increased velocity, the resistance of the element through which the ball is passing in its flight, increases in so much more rapid ratio that the point is soon reached at which the momentum is overcome and the power of penetration reduced. For the same rule holds with the air as with water, though, of course, the point at which momentum and resistance balance each other, is sooner reached with the latter than the former.

A similar and very instructive experiment is related in an English treatise on "Shot guns and sport-

ing Rifles" by "Stonehenge." Six shots were fired from the same gun, with the same charge of powder into sand. The two first were fired at a short distance and, of course, struck the sand with their initial velocity but slightly diminished. The penetration was about a foot—(I quote from memory—the principle being all I wish to establish)—and the balls were flattened and turned back at the points so as to look like mushrooms. The next two, fired at considerably greater distance, were much less deformed, but penetrated about double the depth of the first; and the two last, fired at a long range, penetrated about three feet, and retained their original shape.

Now let us apply these tests to the question of range. The opposing material in this case is the atmosphere, and the problem to be solved is, what degree of velocity will enable a projectile of given weight to attain the greatest penetration of this material; or in other words, what must be the proportion of velocity to weight to enable it to attain the greatest range? We have seen by the experiment with the water that with a certain velocity the ball is stopped and flattened, while with a much less charge it passed through it, and penetrated the bottom of the tub in which it was contained. The air being thinner and more yielding, would, of course, admit the passage of the ball with much greater velocity than water; but still the rule holds



with both that a point may be reached at which the resistance becomes so great as to overcome the momentum and react upon the projectile, and the attempt to increase the velocity beyond that point by adding to the charge, will in fact diminish the range, and also the precision of the shot, just as we have seen to be the case in the experiment of shooting into water.

These questions are very fully discussed and proved by experiments, which are exceedingly ingenious and curious, in a series of tracts which were read before the Royal Society, and published more than 100 years ago by Benjamin Robins, the only copy of which that I have been able to find is in the Library of Harvard College.

From a great variety of experiments he deduces the facts that "Till the velocity of the projectile surpasses that of 1,100 or 1,200 feet in a second, the resistance may be esteemed to be in the duplicate proportion (or square) of the velocity; but that if the velocity be increased beyond that degree, then the absolute quantity of that resistance will be near three times as great as it should be by a comparison with the smaller velocities. For instance, the resistance of a 12-lb. shot moving with a velocity of 1,700 feet in a second, instead of  $144\frac{1}{2}$  lbs., which I have assigned it in a former paper, will be three times that quantity or  $433\frac{1}{2}$  lbs."

He supposes this increased ratio of resistance to be caused by the more dense packing of the air in front, and the formation of a vacuum in the rear of the projectile, and that such a vacuum is not formed till the above degree of velocity is reached ; and he calls attention in a note to the curious fact that this degree is precisely that at which sound is transmitted.

Elsewhere (page 243) he shows that this increased resistance renders it impossible to add greatly to the range by increasing the initial velocity beyond a certain point.

He found that the range of a 10-lb. ball, with the enormous charge of 18 lbs. of powder, was only one fourth more than with a charge of 2 lbs.

The following rule and its proof are so important and so directly to the point that I give it verbatim :

“MAXIM XII.

“From the sudden trebling the quantity of the air's resistance, when the projectile moves swifter than at the rate of 1,200 feet in a second, it follows that whatever be the regular range of a bullet discharged with this last mentioned velocity, that range will be but little increased, how much soever the velocity of the bullet may be augmented by greater charges of powder. For by the extraordinary reinforcement of the resistance in all velocities

surpassing that of 1,200 feet in a second, the motion of the bullet how swift soever it be, is soon reduced to this last mentioned rate. I find, for instance, that a 24-lb. shot, when discharged with a velocity of 2,000 feet in a second, will be reduced to that of 1,200 feet in a flight of little more than 500 yards. Now as the velocity of 2,000 feet in a second is much greater than what a 24-lb. shot receives even from two thirds the weight of the bullet in powder, and the velocity of 1,200 feet in a second may be produced by little more than a fourth part the charge, it appears from hence how speedily all the additional celerity is taken away, which arises from the utmost reinforcement of the charge beyond that of a fifth or a sixth of the weight of the bullet in powder. Whence, as any excess in the velocity of the projectile above that of 1,200 feet in a second is thus precipitately destroyed by the resistance, it is easy to conceive, that the regular range of a bullet, fired at any considerable angle with the greatest charge possible, will but little exceed the range of the same bullet, when fired with a fifth or a sixth of its weight of good powder. I find, for instance, that the regular range at  $10^{\circ}$  of a 24-pounder, fired with 24 lbs. of powder, will not exceed the range of the same piece at the same angle when fired with only 5 lbs. of powder, by more than 500 yards; the whole range being above 3,000; so that with

charges in the proportion of 5 to 24 the ranges are only as 5 to 6. And this not from any defect of the action of the powder in the larger charge, but solely from the extraordinary action of the air's resistance."

In this connection the problem presents itself of the resistance of the air to the passage of the bullet within the barrel of the gun. It is obvious that this must be very much greater than that which it encounters after leaving the barrel, for the reason that it is in the form of a solid column of the length of the barrel, which must be pushed forward as it has no opportunity to escape at the sides. Various experiments have been tried which prove that this resistance must be very great. Greener relates the following:

"If a cartridge, having a bullet at each end, is placed in the centre of an open barrel eight feet in length, and a touch-hole drilled as near the centre of the cartridge as possible, when it is fired the balls will certainly be discharged from the barrel, but with a very small degree of force; in fact, merely driven out.

"With the same instrument vary the experiment; place in it a cartridge charged with one ball, three feet from the muzzle, leaving a column of air five feet in length to act against the explosive force of the powder, and the ball will be driven 100 yards

with considerable force. Again let a third cartridge be introduced similar to the last, two feet from the muzzle, increasing the column of air in its rear to six feet, and the result in distance and velocity will nearly double what was obtained by the previous experiment; tending to prove that air thus forced back upon itself obtains a density, and consequent resisting influence nearly equal to a well screwed breech."

The following experiment, in proof of the same fact, was told me by Dr. Maynard :

The barrel of a gun was pierced with a great number of small holes for more than half its length from the muzzle toward the breech. It was then enclosed in wrappers of paper, pasted tightly over each other so as to form a very thick and strong envelope, and was then loaded with only a wad over the powder, and fired in a room. The air was instantly filled with a shower of bits of paper, blown out from over the holes; but on examination, not a single piece could be found which was in the least discolored by smoke—showing that it was the force of the air in front of the charge which burst them out.

These experiments afford sufficient proof that the ball has to encounter an enormous resistance from the air during its passage through the barrel, and the gun itself must endure a corresponding

strain from the action of the contending elements within it.

It is doubtless from the action of the air, and not from that of the powder, that cheap shot guns are so frequently burst or bulged, at or near the muzzle, which is where the air would exert its greatest force while that of the expanding gas is greatest at the breech.

The principle of rifling invented by Mr. Atwater, of Chicago, has for its object to relieve this resistance, and the result seems to have been successful, though the means adopted involve an apparent contradiction of principles, which have heretofore been considered indisputable. His plan is this: Supposing a barrel to be rifled with an even number—say six grooves; he begins at the muzzle, and cuts out each alternate land down to within eighteen inches, or thereabouts of the breech. The effect is that the ball starts from the breech with a perfectly tight fit, and so proceeds till it reaches the point where the lands are removed. From there to the muzzle it is held in place, and the rotary motion is preserved, by the three remaining lands, while the intervals between them are open spaces which admit the passage of the air between the ball and the sides of the barrel. According to previous theories, any one at all acquainted with the subject would have been ready to assert that the expansive power of the gas

behind would be so much greater than the resistance of the air in front, that the only effect would be to weaken the force of the discharge, by allowing it to escape through these openings. Such, however, does not prove to be the case, as the range or penetration is found to be very greatly increased by the operation. I have only once had an opportunity of witnessing a trial of a gun of this description, and the trial in that case was not a fair test, as the gun had previously become so rusted that it had to be rubbed out with emery, and the balls in consequence were too loose in the bore. But even with this defect the average penetration at 100 yards, was one third more than that of an ordinary rifle of the same caliber with the same weight of powder and lead; and in addition to this a very singular feature of the experiment was, that every ball from the Atwater gun, whatever might be the degree of its penetration, preserved its shape perfectly, so that bullets of soft lead, which had penetrated ten or twelve inches of pine boards were not in the least deformed, but looked as if just swedged.

The following letter from Mr. W. H. Butler, of Chicago, (under whose supervision the piece of ordnance whose wonderful performance he describes was manufactured,) was in reply to my application for such details of the history of the invention as might be of interest to the public.

“CHICAGO, *June 22d*, 1863.

“The invention was patented, March 6th, 1860, by Mr. J. B. Atwater, of Ripon, Wisconsin, now a resident of Chicago.

“The idea of relieving the ball of a portion of the resistance consequent upon the packing of the air in front of it, does not seem to have entered the thoughts of those whose occupation confined them to practical experiments with rifled firearms. The development of the principle was left to one whose thoughts had been previously directed in quite a different channel.

“Mr. Atwater is, perhaps, more widely known to the public in connection with the drama, having opened the first theatre in California in 1849. This profession he abandoned in 1857, since which period his time has been devoted to the study of mechanics.

“The first idea of this improvement originated in experiments with an atmospheric engine, which Mr. Atwater had constructed.

“The most singular fact connected with the invention is that no subsequent alteration or modification in mechanical construction during three years of experiments, has been found to develop the principle so thoroughly as the exact mode of rifling first adopted. A principle at war with established theories leaped into light—a model of perfect development.



“That an improvement of so much importance to the world should have been treated with neglect would seem strange indeed, did we not know that such a fate not unfrequently attaches itself to great and truly useful inventions. Prejudices have to be overcome, but facts are stubborn things, and sooner or later truth must prevail.

“At the breaking out of the rebellion, this improvement was proffered to our Government, but no notice was taken of the offer.

“A six-inch gun (twelve feet long, and carrying an 80-lb. shot) was constructed and rifled on Mr. Atwater's principle, and is now on test at the Washington Navy Yard; and from experiments already tried, we are warranted in saying its range is nearly one third greater than that of any other gun ever fired.

“At  $5^{\circ}$  elevation it threw its ball 2,880 yards, being 960 yards more than the Armstrong gun does, at the same elevation.

“Since the invention has been patented, experiments have been made to show the pressure of the gases at different points along the bore of a gun, and others to show the resistance of the atmosphere on a ball moving at the rate of 1,000 feet per second, which go to show some of the probable causes of the increased force of this gun, (see Capt. Rodman's

and Lieut. Simpson's works on ordnance,) among which are the following :

“Lessening of friction, and of resistance from the column of air, by allowing the ball to pass it while in a compressed state within the gun. Supplying the vacuum with air through the recesses after the ball has passed the cut-offs. Increased expansion of the gases by admission of atmospheric air.

“In small arms the best result has been obtained from a  $\frac{3}{8}$  bore and 33-inch barrel, which penetrated  $26\frac{1}{2}$  inches in soft pine.\* This gun had the lands cut out at 22 inches from the breech.

“With a 40-inch barrel and  $\frac{1}{2}$ -inch bore, with lands cut out at 18 inches from the breech, the penetration was 17 inches. Same gun with lands cut out at 12 inches from the breech lost  $16\frac{1}{2}$  per cent. in penetration.

“From experiments made thus far, we judge that from 18 to 22 inches from the breech is the point to commence cutting out in guns of ordinary length. The depth of groove must be somewhat in proportion to the diameter of the bore.

“Experiments for accuracy have not been very extended, but sufficient to demonstrate that it is

\* This is more than double the average of the Springfield and Enfield rifles, but is not equal to the best record of the Whitworth.—H. W. S. C.

equal if not superior to the best rifles of the old model.

“Mr. Freeman of Fond-du-Lac, Wisconsin, has tested it more fully than any other man. He made seven shots from the shoulder at twelve rods, and put the whole seven balls in one hole  $\frac{3}{4}$  of an inch in diameter. He has also used it for turkey shooting, and kills at 80 rods nearly every shot. He offers to put up \$1,000 and shoot against any gun in the world but no one has dared accept, though it has been a standing offer for the last year.” \*

It is needless to say that this discovery seems to comprise the most important improvement which has been made in gunnery for a very long time. The principle is one which may be readily applied to any and every rifle, and with a manifest immediate increase of its power.

If the facts are as represented (and so far as I

\* Since my MS. was placed in the hands of the printer, I have received from Mr. Butler the following report of a comparative trial of this gun with the Dahlgren and Parrott guns:

“Distance 1300 yards.—Target 20 feet square.

Dahlgren—Elevation	2° 45'	.....	19 hits out of	40.
Parrott,	“	2° 45'	.....	32 “ 40.
Atwater,	“	2° 15'	.....	40 “ 40.

The lowest elevation at which the Atwater gun was fired was 2° 08', and the ball struck two feet above the bottom of the target.”

have had an opportunity to examine I have seen no reason to doubt the statement) the principle it develops must of necessity be universally adopted. It promises too much to be suffered to rest where it is, and as soon as it is made evident that these advantages can be secured by it, and are not accompanied by corresponding defects which counterbalance them its application will become an imperative necessity to every rifle.

Comparatively few people attain any definite conception of the force of a rifle ball from the mere statement of the amount of its penetration. The following illustration may assist those whose experience does not enable them to appreciate such a test: I was shooting one day at a distance of 150 yards at a target, which was made of the cover of a large packing case, bound with thick iron straps, which were riveted to oaken cleets on the under side. One of the bullets happened to strike this strap, and although it was quite near the edge, it passed directly through, then through the pine board and oaken cleet, each half an inch thick, and buried itself in a cedar post behind. The bullet weighed half an ounce, and was shot with a charge of only thirty-eight grains of powder. I then laid the target upon a large flat rock, and taking a stout iron spike, I set it upright with its point on the strap, supporting it with a stone on each side, and tried

the effect of a blow with a four-pound sledge hammer given with my full strength with both hands. I barely succeeded in punching a hole through the iron and penetrating the pine wood about a quarter of an inch. The spike being pointed, of course made a hole in the iron scarcely an eighth of the size of that made by the bullet; and considering the difference of penetration, it is safe to say that the force of a half-ounce ball at the distance of 150 yards is at least four times as great as that of a blow of a four-pound sledge hammer in the hands of a moderately strong man. It is but a rude illustration, but may serve to aid the mind in grasping the subject.

The fact of the atmospheric resistance increasing in such rapid ratio to the velocity renders it important in testing the penetration of different guns, that the shots should be fired at a very short range, as otherwise the power gained by increased velocity will very soon be neutralized by the air; and for the same reason, it is obvious that increased penetration, if gained by increased velocity and without additional weight of projectile, will not secure an increase of range.

## CHAPTER V.

### MERITS OF DIFFERENT CLASSES OF GUNS, METALLIC CARTRIDGES, ETC., ETC.

THE difficulty of deciding upon the relative merits of the different rifles which are offered for the inspection of a purchaser, may be judged by the following extracts from the descriptive pamphlets, which have been issued, by way of making their advantages known to the public, by the proprietors of some of the best patterns of arms.

Of the Maynard rifle it is asserted that "Engineers, scientific and practical, are unanimous in their praise of this rifle, as being a most admirable example of the true arrangement of mechanism and distribution of material, to secure the utmost degree of strength and durability within a certain weight. Practical gunmakers speak of it as the best studied rifle yet produced of the breech-loading order."

General Scott says of this rifle: "It is the most beautiful piece of mechanism I ever saw.

"It seems to do all that is required of a military rifle, and to do it in the best possible manner."

And of the Maynard primer he says : " It is the greatest improvement in firearms made within a century."

Lieut-Col. B. S. Roberts, of the Regt. of Mounted Riflemen, U. S. A., says, July 14, 1859 :

" I am sure the merits of your gun over all other breech loaders, for mounted troops and skirmishers, will be acknowledged. It seems to answer every end that the soldier and sportsman could have desired, or ingenuity devise and apply to practice. I have used your rifle at every distance within the range of any accuracy of vision, and its precision and penetration surpass any expectation I had ever formed as within the accomplishment of small arms."

Henry H. Lockwood, Professor of Field Artillery and Infantry Tactics at U. S. Naval Academy, says :

" Being curious to compare it (the Maynard) with the Minie rifle, I fired both weapons at both short and long ranges. In point of accuracy and range, I found the Maynard vastly superior.

At 1,400 yards I found it necessary to give the Minie double the elevation of the Maynard to reach the same object. I have seen no piece at all comparable to it for convenience of handling and loading. I have no hesitation in pronouncing the Maynard the most remarkable rifle I have yet seen, and

as such, well worthy the patronage of the Government and the public."

The proprietors of Colt's rifles claim that "They have been thoroughly tested by all classes of men in every country," and have been proved to possess the following among other very important advantages :

"They have a force and accuracy, which have no parallels in the history of firearms.

"They are simple in construction and easily taken care of.

"They are made of the best steel that can be procured for money, and have the strength to resist the explosive force of gunpowder, while the mongrel imitations and cheap arms are more dangerous to their owners than they are to all others.

"They are well finished, and as cheap as a good arm can be made by the aid of modern machinery and skilful labor.

"They have been adopted for the service of the U. S. by the Army Board at West Point in 1858, and for many years previously, as superior to all others."

Lieut. Hans Busk, of the Victoria Rifles, author of "The Rifle, and how to use it," says in a letter to Col. Colt, dated April 28th, 1859 :

"Your rifle is by far the most complete specimen of a soldier's firelock that has yet been pro-



duced, and considering that I have fired more than 68,000 rounds from my own shoulder, my opinion in such matters is, perhaps, worth more than the mere empty praise of a green hand; let any one who wants to know what a Colt can do, take my word for it, that for efficiency and strength of shooting, *nothing can beat it.*"

Col. Charles A. May, U. S. A., writes to Col. Colt:

"April 8th, 1858.—In reply to your note, requesting me to state whether or not I had in view the comparative value of Sharp's carbine and rifle with that of your arms, examined by the Board, of which I was a member, I have to state that I had not only Sharp's carbine in view, but all others which have been used in our cavalry service for the last twenty years, and in my opinion yours is superior to them all in every respect."

The Merrill patent breech-loading rifle is said, by its proprietors, to be "the result of a great deal of experiment by the inventor, whose vast experience and long practical study of the manufacture of arms both in America and Europe, has enabled him to give to the world this great improvement in small arms, which classes him among the most prominent of modern inventors. The simplicity and strength of construction arrived at in the Merrill

rifle are only equalled by its extraordinary range and accuracy of fire.

“For sporting purposes or target shooting, it cannot be equalled, as it has attained the highest perfection in every respect.”

Letters and certificates from the highest authorities fully confirm these assertions; and without multiplying extracts, it is sufficient to say that these are but samples of a multitude of advertisements, each of which affords undeniable proof of the very great superiority of the weapon it describes over all others. The inexperienced purchaser who proposes to provide himself with a rifle, may well be pardoned if he finds himself at his wits' end in attempting to decide upon a choice. If, in his perplexity, he seeks the advice of others, whom he supposes to be familiar with the subject, it is altogether probable that he will but add to his confusion. Few men have the opportunity or taste for making comparative trials of a great variety of guns, and almost every one soon acquires a special fancy for some particular pattern, and urges its adoption by others with the persistency which is so common with those who cannot conceive of differences of taste.

In the midst of his difficulties, however, the purchaser may glean a crumb of comfort from the reflection that he has a very large choice of really

excellent instruments, and that the very fact of the competition of so many varieties is a guarantee that there will be no falling off from the standard of excellence of material and workmanship on the part of any of the manufacturers, whose interests are dependent upon the maintenance of the superiority they claim to have attained.

Neither can it be denied—paradoxical as it may appear—that in some sense there is or may be truth in the assertions of every one of them.

Perfection, in all points, is not attainable; and it is for individuals to ascertain their own wants, and ordnance officers to decide upon those of the army, and select the arms which most nearly fulfil their conception of the standard of excellence.

In attempting, therefore, to give some hints which may be of service to others in the choice of a gun, I shall confine myself to the explanation of certain principles, whose application must be left to the individual who alone is capable of deciding upon the demands of his own tastes or necessities.

If the object be to procure a gun merely for target shooting with the greatest possible precision nothing superior to our best muzzle-loading American rifles can be found. Of these the target rifle, which I have elsewhere described, may be taken as the model, to be modified in weight, caliber and finish, to suit the tastes of the purchaser. By re-

ducing the gun to ten or twelve pounds' weight, and dispensing with the telescope, he may have a serviceable weapon for sporting purposes ; but if he dispenses with the false muzzle, he must not hope to retain the degree of accuracy which is its distinctive point of superiority in target shooting ; for it is not possible, without it, to be certain that the elongated bullet is inserted perfectly true. This is too cumbersome an appendage, and involves too much time in its use to be admissible for field-service.

I refrain, therefore, from giving any further description of these guns than that given in the chapter on the target rifle, for the reason that I should despair of adding anything of real value to what has already been said and proved by able writers, and also because I believe the great majority of my readers will be more interested in a discussion of the comparative advantages of such guns as are more available for active service in the field. Nine out of ten of the men who are now providing themselves with rifles and learning to use them, are incited by the feeling that it is a branch of education which should not be neglected at such a time as the present, and with an undefined feeling of possible danger, they wish to provide themselves with the most efficient means of self-protection. No reasonable man can deny the probability that emer-

gencies may arise during the settlement of the problems which must be solved before the present storm subsides, which may lead to turbulent demonstrations, and which ambitious and unprincipled men may endeavor to seize upon to overturn our liberties, if we are unprepared for their defence. The danger of such an attempt will be greatly diminished, and its chance of success, if attempted, will be much less, if the people are armed and familiar with the use of arms. For any possible purpose of defence or sporting service to which they are likely to apply the weapon, a gun which can be relied on to put every shot into a ten-inch ring at 200 yards is good enough. But this expression needs explanation. The best marksman in the world may take a gun to which he is unused and before he becomes accustomed to its shooting, that is, before he learns the exact relation of its line of sight to its line of fire, he can do no good shooting with it. But it is easy to ascertain this by a little practice, and having done so, the capacity of the weapon may be very soon decided. It will, perhaps, be thought a waste of words to make such an assertion, which seems almost self-evident; but I am led to it by hearing it recently asserted that little or no value was to be attached to the certificate of an expert, in regard to the precision of a rifle, as arrived at by a series of experiments in shooting with it; and the assertion

was illustrated by the statement of the fact, that if two of the best marksmen exchange guns, they will do no better than other men.

This is only true in a limited sense; and it is absurd to deduce from it that the precision of any rifle cannot be ascertained by shooting it. Any experienced rifleman, by firing a few shots from a dead rest, aiming always exactly at the same point can satisfy himself whether the gun shoots true. If the shots are grouped together above or below, or on either side of the point aimed at, it is plain that its shooting is uniform; and by arranging the sights so that the line of sight may coincide with the line of fire, or by aiming in such a manner as to allow for the variation, the error may be easily rectified. If, however, the shots wander, and strike on every side of the point aimed at, it is evident that the shooting is inaccurate, and no degree of skill on the part of the shooter can enable him to remedy an evil which it is impossible to estimate beforehand.

I have seen elaborately-finished rifles whose attractive appearance would go far to convince an inexperienced person, that such beautiful workmanship would never be expended upon a worthless instrument—which could not be depended upon to place five shots in succession in a two feet ring at sixty yards, and it is needless to add that such a

weapon possesses no more intrinsic value than a smooth-bored musket.

I am well aware that a large class of riflemen whose estimate of the value of a gun is based upon its capacity to make a string of shots in which the measurement of fractions of an inch decides the question of superiority, will regard with almost equal contempt the gun which I have stated to be "good enough" if it is capable of putting every shot in a ten-inch ring at 200 yards. To such men I have only to say that, in so far as such shooting as they practise is done for experiment in ascertaining the possible accuracy which may be attained in rifle shooting, I regard the weapons they use as valuable, and the experiments exceedingly interesting. But I have no sympathy whatever with the gambling spirit which actuates a large class, who prize a rifle solely for the power it gives them to win money—a practice which tends directly to degrade and bring into disrepute a noble and manly art.

I would not have it supposed, from this expression, that I am tinctured with the puritanical spirit, which would emasculate us, by forbidding the use of whatever is liable to abuse; but, on the contrary, it is precisely because I detest such a spirit that I am impatient of the application of any artificial

stimulus to a sport whose intrinsic interest is sufficient to satisfy a healthy appetite.

The rifles with which such nice work is done, can never be made available for any practical purpose ; and the object in view in encouraging a taste for rifle practice is that we may at all times have a body of men who are familiar with the use of serviceable weapons. Now I presume it will not be denied, that any man deserves to be called a marksman, who at off-hand shooting can put every shot into a ten-inch ring at 200 yards ; and if a gun has been proved to shoot with sufficient accuracy, to do it from a rest, it depends solely upon the skill of the shooter whether it can be done from the shoulder.

This standard of precision is attainable by guns which are in every way available for service, and for all practical purposes the advantages they possess are far more than a balance for the superior accuracy which is attained by the addition of such incumbrances as must render the gun useless, except under circumstances which only occasionally present themselves in military service, and never to the sportsman.

As the evidence is ample and incontrovertible that the standard of precision I have indicated is within the easy attainment of many of the breech-loading rifles which are now in the market, and as their superior efficiency in all other respects is suf-



ficiently obvious to render any argument unnecessary, I proceed to consider the advantages and disadvantages of some of the different patterns in order to assist the reader to decide for himself as to which is best adapted to his wants.

Breech-loading guns may be divided into two general classes, the first including those which may be loaded with loose powder and ball, or a paper, linen or metal cartridge, requiring a cap for its ignition, and second those which use a metallic cartridge having the fulminating composition in its base, which is fired by a blow of the hammer directly upon the cartridge itself. And these last may be again divided into the class which use only a single cartridge, and require reloading after each shot, and the magazine, or repeating rifles, in which a number of cartridges are inserted, in a receptacle prepared for them, and which may then be fired in rapid succession till the magazine is emptied.

It cannot be denied that the metallic cartridges possess some very important points of superiority over any other kind of ammunition. There is no form in which ammunition is so compact and so easily portable. They are perfectly water-proof, and may lie almost any length of time under water without injury, whereas it is a constant source of trouble on the march, and in camp to preserve the ordinary cartridges from injury even from a damp

atmosphere. They do away with the necessity of using percussion caps, which especially for cavalry service is an inestimable advantage, and finally they may be so easily withdrawn and replaced, that a miss-fire occasions only the loss of a second or two, whereas if a cap fails to ignite the charge, much time is often lost in pricking powder into the tube, and even then the attempt is not always successful.

On the other hand, it is objected that they can only be prepared at the factories, and if the supply is exhausted the guns are of no more value than so many sticks, as they can only be used with the special ammunition provided for them. That this is a specious objection may be rendered evident by the fact, which I very well remember, that it was urged with equal earnestness against the introduction of percussion caps. Those who make it do not sufficiently realize the fact that demand creates supply, and that the cartridges will be as abundant in the market as powder or caps, as long as they are wanted by sportsmen, while for military use it is certainly as easy to keep an army supplied with such ammunition as with common cartridges and caps. Another objection for the sportsman is that he is restricted by the use of such ammunition to precisely the same quantity and quality of powder under all circumstances. This with many might be considered an advantage, as saving the necessity

of measuring the charge for themselves ; but those who are fond of trying experiments with different charges, will be apt to be impatient under such restriction.

But the greatest, and indeed the only serious objection to this form of ammunition remains to be noticed ; and I have been greatly surprised to find that many persons, with whom I have conversed, had not thought of it, till I suggested it to them. I allude to the danger of explosion from concussion, owing to the powder being always directly in contact with the fulminating composition.

The danger from this source, *if the cartridges are properly constructed*, is not such as need excite apprehension of explosion from the ordinary accidents to which they might be exposed in transportation ; but the difficulty is that no one can tell beforehand whether they are so constructed ; and if the composition contains too large a proportion of explosive material, a light blow may produce the effect. I have thrown the cartridges against stones till they were battered out of shape, and have hammered them flat upon a block of wood, without producing an explosion—but I have also known them to be exploded while lying on a block of wood and struck with a wooden mallet, which proves that the liability to explode is variable. I once exploded one which had been hammered flat on a block of

wood, by laying it on a stone and striking a single light blow upon it, and the ball struck a fence 100 yards distant with considerable force. I would advise no one to try experiments of this kind with them, however, as they are by no means safe. On the whole, I do not think the danger of accident in ordinary transportation to be of sufficient importance to prevent their use by sportsmen.

But whatever may be thought of the self-exploding cartridges for sportsmen's use, there can be no doubt of their liability to explode when struck by shot. I have repeatedly fired a ball into a box containing ten or a dozen of them, and never failed to explode at least four or five, blowing the box to pieces and scattering the remains of the cartridges in every direction. I have the remains of several such explosions now on hand, consisting of shattered shreds of copper, cartridges jammed out of shape, and bullets transformed into shapeless masses of lead, the whole bearing evidence of a performance which it would be anything but agreeable to have enacted in a cartridge box hung to one's belt. The effect, therefore, of a shot striking a soldier's cartridge box would be disastrous to himself and those in his vicinity, while a similar accident to an ammunition wagon would involve very certain destruction.

General Jacob's rifle-shell was designed ex-

pressly for blowing up the enemy's ammunition wagons ; but if the ammunition were in the form of self-exploding cartridges, no shell would be required, as the effect would be produced by any chance or accidental shot even from those who had it in charge.

Notwithstanding this danger, however, the advantages of these cartridges are so great and in practice they have proved so satisfactory, that their experimental use has elicited such commendations, as to lead to an earnest demand for their extensive introduction in the army. It is not surprising that an invention, which is so reliable and efficient in action, and which relieves the soldier from so much of the care and uncertainty to which the common form of ammunition is necessarily liable, should be enthusiastically received, and continued experience can alone decide the question, whether the objections I have mentioned are of sufficient importance to balance the obvious advantages. The "needle-gun," which is equally liable to the danger of explosion from a shot, and is much less convenient and simple in its arrangement, has been exclusively adopted in the Prussian service. This gun is a breech-loader, and the powder is fired by a needle, which pierces the whole length of the cartridge, and strikes a copper cap containing the fulminating composition, in the base of the bullet, so that the

charge is first ignited at the end next the bullet. Whatever may be the decision, however, in regard to the use of self-exploding ammunition, there can be no doubt of the very great superiority of metallic cartridges over those of paper or cloth, in their facility of transportation without injury from moisture or bruising, as well as their convenience and their superior adaptation to breech-loading guns, and those invented by Dr. Maynard and used in his rifle, possess all of these advantages, and are safer than any form of ammunition that has yet been produced, though they require a cap or its equivalent in the form of the Maynard primer for their ignition. If the latter is used, their efficiency is equal to that of the self-exploding cartridges ; and it is asserted by the original manufacturers, that the primers which were made at the U. S. arsenals, after the purchase of the patent by the Government, and which proved so inefficient in actual service as to cause their final rejection were not made according to the original recipe, but were subjected to various modifications, which caused their failure.

For invariable delicate accuracy of shooting there is no doubt of the superiority of the Maynard cartridge over those which are compressed by machinery about the base of the bullet ; but this difference is not of sufficient importance to constitute an objection in ordinary military service.

The question of preference, however, still remains between the guns which use the single cartridge and require loading after each shot, and the magazine or repeating guns.

The first successful application of the repeating principle to firearms in modern days, was that of Col. Colt, and notwithstanding the frequent citing, by those who would detract from his merit, of the fact that the armories of Europe contain specimens of revolving guns, made as long ago as the time of Cromwell, I do not admit that he is any the less entitled to the honor of the invention.

For, inasmuch as the gunmakers of Europe had continued for three hundred years to manufacture their arms on the old-fashioned plan notwithstanding the existence of those revolvers, the inference is not only a fair but an obvious one, that no small degree of ingenuity was required to adapt the principle to modern necessities by the production of so perfect a weapon as that of Col. Colt. The importance and value of the invention were so apparent, that his pistols became at once a necessity to the whole civilized world; but the principle was not found of so much importance in its application to rifles as for the smaller weapons, which only come into use in close encounters, where no time is afforded for reloading, and where the contest must be decided by a few rapid shots. Occasions may doubt-

less often arise in the course of an action, when it would be exceedingly desirable to be able to pour upon the enemy such a cataract of fire as might be done with the repeating gun; but in considering the question of general utility, it is never safe to be governed by the possible advantages arising from the occurrence of special and unusual circumstances.

The repeating guns may, indeed, be fired with very great rapidity till the magazine is exhausted; but a corresponding delay must then ensue till it is replenished. The interval between the shots need be only about the time required to cock the lock and pull the trigger; but when the magazine is emptied it must be refilled by a process occupying about the same time as that required for loading an ordinary muzzle loader. In continuous firing the repeating guns possess no advantage in point of time over those which use but a single cartridge, and the latter possess one important point of superiority in the fact that their manipulation involves only a constant repetition of motions so simple that they may be performed instinctively and without thought, whereas the repeaters require a replenishing of the magazine when exhausted, which is comparatively an operation of time and care, since the accidental insertion of a cartridge wrong end first, which might easily occur in a moment of intense excitement, involves delay and a necessity of re-



moval which is often troublesome. For individual defence against numbers, however, the value of repeating guns is inestimable. In the defence of a house, for instance, a single man armed with a repeater, might hold at bay a small host of enemies; and if provided with a pair of them, so that they could be reloaded in succession, which might be done by a woman or a child, he would possess the defensive power of a pretty formidable garrison. A case in point has been related to me of a Union man in Kentucky, who, having been threatened by his disloyal neighbors, had fitted up a log cabin near his house as a place of retreat and defence in case of attack.

While dining with his family he was attacked by seven guerrillas, who burst into the room and fired several shots, one of which broke a glass in the hand of his wife, but luckily all missed their aim. He sprang to his feet and called upon them if they were determined to murder him, not to do it in the presence of his family, but allow him to go out to be shot. To this they agreed, and on reaching the door he started for the cabin, succeeded in reaching it, and seizing a Henry rifle, (which fires fifteen shots in succession without reloading,) he killed the whole seven with eight shots. He is now in command of a company of cavalry, which, in considera-

tion of this exploit, has been armed by the State with Henry rifles.

For the sportsman's use the repeating rifles offer advantages which may occasionally prove of very great value, as for instance on discovering a number of deer together, or in case of wounding an animal which might make its escape or prove dangerous before an ordinary gun could be recharged. Yet even in such a case the single-cartridge guns might often be reloaded in time. I know an instance of a fish-hawk having been killed on the wing with a Maynard rifle, which was first fired at him on his perch, and then reloaded for the fatal shot. In this case the Maynard primer was used, of course, as there could not have been time to cap as well as load ; but the same facility would be offered by any gun using the metallic cartridge with fulminating powder in its base.

The breech-loading guns which use a cartridge of paper, linen or metal, and require also the use of a cap, are free from the danger of accidental explosion of the ammunition to which those are liable which use the copper cartridge with the fulminating powder in its base. None of these, however, can be very easily used with loose powder and ball except Colt's, and for the sportsman's use I consider a paper or even a cloth cartridge to be an objectionable form in which to carry the ammunition. I al-

ways use Colt's with loose powder and ball, and find it more reliable than when used with the cartridge. It takes longer to reload than other breech loaders ; but with its reserved shots it meets every possible deficiency in that respect which can affect the demands of the sportsman. It is very rare that a necessity or an opportunity occurs for the delivery of more than two shots in very rapid succession, and probably the occasion would never offer for discharging the contents of all the chambers without an opportunity to reload.

Having now considered the general merits of the different classes of guns, I proceed to describe some of the best varieties, giving in most cases the advertisement of the proprietor, and adding my own comments as I have had opportunity to make them.

## CHAPTER VI.

### DESCRIPTION OF RIFLES.

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#### SHARPS' RIFLE.

No breech-loading gun has attained a more wide-spread celebrity than this, and in its improved form, it is probably as good a weapon of its kind as any in the market. I give below the statement of the manufacturers in regard to its merit, which is certified to by a long list of officers and others, who have thoroughly tested its qualities for field service.

My own opinion in regard to this and other breech-loaders of the same kind, that is, such as are loaded with a common paper or cloth cartridge, is that they are better adapted to military use than to that of the sportsman, unless it be for shooting buffaloes, or other very large game. For reasons which will be given in my description of the Maynard rifle, and which I have found to hold good in practice, I do not believe they can be relied on for that invariable nice accuracy which every sports-

man desires to secure, however admirably they may be adapted for army use, or for rough service on the frontiers. The cartridges prepared for these rifles by the company are of stout linen, strong enough to bear rough handling, the base only being of paper, through which the powder is ignited by the explosion of the cap.

The gun is thus described by the manufacturers :

*SHARPS' patent improved breech-loading and self-priming Rifle, Carbine, and Shot-gun.*

These arms have now attained the highest perfection in every respect. The proprietors have adopted all the improvements that ten years of experience could suggest. The primes are carefully prepared, are water-proof and *sure fire* ; the arms and their parts are of new and most approved patterns, the gas-check shuts off every particle of escape, and the manufacturers challenge the world to produce an arm of superior material, strength, accuracy, force, safety, or rapidity and certainty of fire. They are self-priming, with Sharps' primer, and adapted to the use of the army percussion cap. The barrel is of cast steel, and its chamber or ball-seat is counter-bored, slightly conical, the exact shape and diameter of the ball, so that the ball, when properly forced to its seat, has its axis exactly coincident with that of the bore ; the rear of the bore contains an adjustable bouching, and the space between its forward end and the base of the ball admits the clamp and rod, with which the bouching is driven back in adjusting it.

Numerous reports from the ordnance, and other army boards, and letters and certificates on file in the Ordnance Office at Washington, attest the superior quality and efficiency of Sharps' rifles and carbines, which have withstood every

test, and the most satisfactory of all, ten years' service in the field in the hands of United States troops, and on board our ships of war. They have also been supplied, in large numbers, to the British, Mexican, Peruvian, Chilian, and Venezuelan governments, and are highly esteemed in the service. More than this, it is the *only breech-loading arm* of any account in which *loose powder and ball* can be practically used with effect or safety; others requiring a very expensive and peculiar kind of fixed ammunition, which cannot be prepared in the field, and is of no service except it be used in the particular style of arm for which it was prepared.

The great superiority of our arm is fully established in the experience of this country in its present war.

It is the arm demanded by and furnished to the *sharpshooters*, after fully testing the various other styles presented, not without injury to themselves in some cases, and it is the first choice of the masses of both infantry and cavalry as a service arm.

Sporting rifles have been sold in such great numbers that their merits are fully appreciated. The recent improvements having removed the only defect, the escape of gas at the joint, these arms are now recommended as being the most perfect arm of the times.

In point of material, workmanship, and accuracy or rapidity of fire, as compared with any other muzzle-loading, breech-loading, or revolving firearm that can be produced, we say try it, and if the trial does not attest its superiority we shall be disappointed.

At the siege of Arequipa, Peru, in March, 1858, over 600 of Vivanco's men were shot down at the barricades by Castilla's attacking forces, armed with *Sharps' rifles*, sustaining only a trifling loss.

In April, 1858, Colonel Suasue, at the head of 1,000 men of Vidauri's force, armed with *Sharps' carbines*, attacked Governor Manero, in command of 3,000 men of the government forces at San Luis, in Mexico, and achieved a most signal victory, killing upward of 600 men, taking the city,

and making prisoners of Governor Manero and three of his colonels, with a slight loss.

About the 1st of September, 1858, Colonel Wright's command, principally armed with Sharps' carbines, were engaged with the party of Indians that had previously defeated Colonel Steptoe's forces, when armed with the old muskets and carbines. The engagement resulted in a most disastrous rout and defeat of the Indians, with a loss of fifty warriors killed and wounded, while of Colonel Wright's forces not a man was harmed.

J. C. PALMER, President.

SAMUEL H. GREEN, Secretary.

HARTFORD, *January 1st, 1863.*

From a great number of certificates published by the proprietors in their advertising pamphlet, I select the following, which is the only one testifying directly to the accuracy of the weapon in comparison with another gun. The record of the trial is defective in not stating the total or average distance of the shots from the centre. It is an interesting statement, however, and is valuable for the testimony it bears on the general value of breech-loaders for military use, which, I am happy to find, coincides with opinions I have elsewhere expressed.

MARINE BARRACKS, }  
Washington, D. C., Feb. 6th, 1860. }

Sir :—I herewith submit for your consideration, the result of the trials made as to the comparative merit of Sharps' improved rifle and the rifle musket now in use in the marine corps.

I selected for the trial a recruit uninstructed in the man-

ual of either, and the following table is the result of the firing :

MUSKET.		SHARPS' RIFLE.	
No. of rounds fired at 100 yds.,	30	No. of rounds fired at 100 yds.,	40
Hit, . . . . .	13	Hit, . . . . .	35
Missed, . . . . .	17	Missed, . . . . .	5
No. of rounds fired at 200 yds.,	5	No. of rounds fired at 200 yds.,	5
Hit, . . . . .	4	Hit, . . . . .	4
Missed, . . . . .	1	Missed, . . . . .	1
No. of rounds fired at 300 yds.,	15	No. of rounds fired at 300 yds.,	15
Hit, . . . . .	3	Hit, . . . . .	9
Missed, . . . . .	12	Missed, . . . . .	6
No. of rounds fired at 450 yds.,	10	No. of rounds fired at 450 yds.,	7
Hit, . . . . .	00	Hit, . . . . .	5
Missed, . . . . .	10	Missed, . . . . .	2
<i>Recapitulation.</i>		<i>Recapitulation.</i>	
Total number of rounds, . . .	60	Total number of rounds, . . .	67
Hit, . . . . .	20	Hit, . . . . .	53
Missed, . . . . .	40	Missed, . . . . .	14

After Sharps' arm had been fired 100 times and the musket 50 times, I placed the latter in the hands of a recruit who had never loaded a musket, and directed him to commence firing. During two minutes he fired four times, and hit the target once. With Sharps', in the same time, and under the same circumstances, he fired nine times, and hit the target eight, showing a great superiority in Sharps' rifle over the musket for precision, and fully equal in point of range. The difference in rapidity of loading and firing was vastly in favor of Sharps' rifle, being as 4 or 6 to 1—and I also noticed what seemed to me to be a fact of great importance in actual service, that while the marine who exercised the musket was giving unremitted observation to the arm during the process of loading, and remained in a fixed position, the operator having Sharps' rifle could load instantly at a walk or run, keeping his eye on other objects, the arm not requiring the least observation except at the instant of firing. I have seen it stated that celerity of loading and firing might be found objectionable, as the soldier would too soon expend his am-



munition. I had this matter in consideration during the trials, and I am fully convinced that there is no force to such an objection. The soldier in battle, possessed of a gun that can be instantly reloaded, keeping his eye on the foe, confident of his power and strength (that he is always ready), naturally is inspired with courage and self-possession, which is valuable to the soldier.

On the other hand, armed with the muzzle-loading rifle, the soldier's severest trial occurs after he has discharged his piece, and during the interval of reloading; hence it is, after an engagement, so many arms are found disabled by the insertion of the ball below the powder, or double or treble loading.

I can see no reason to justify the idea that a soldier, qualified with an arm possessing great celerity of fire, is likely to waste his ammunition at the first sight of a distant enemy; but, on the contrary, in my opinion, the soldier would carefully reserve his strength until he came to the thickest of the fight.

It seems to me that the efficiency of the soldier can in no wise be disparaged by the fact that he has no time or observation comparatively to bestow in loading his weapon.

On my return from practice, the arms were put away without cleaning for one week, when both were examined; and while the present service musket needed the attention of the armorer at the armory, and much time to put it in order, Sharps' rifle was easily cleaned by myself at the office.

Sharps' arm is simple in its construction, and can be handled by the most inexperienced soldier.

The use of Sharps' carbine for the last seven years in the army, has shown its efficiency as a service arm in the field, sufficiently to authorize its adoption in that branch of the service, and there is no other test but field service which would, in my opinion, warrant the adoption of any arm.

The objections that have been heretofore made to this gun of escapement of gas at the breech, waste of powder by the cut-off, difficulty of inserting the cartridge without burst-

ing it, paper left behind in the chamber, have all been obviated.

I feel authorized, in view of all the facts connected with this arm in the service, most respectfully to recommend its adoption to the marine corps, believing, as I do, that such action on the part of the Government will increase the efficiency of that force more than double its present power.

Respectfully,

J. GREEN,

1st Lieutenant U. S. Marines.

To Col. JOHN HARRIS,  
Commandant Marine Corps.

I have received through a friend an interesting communication from an officer of the United States Sharpshooters, in which he says :

“ Col. Berdan, who has had more than a year of active service on which to base his opinion, considers the Sharps’ improved rifles to be far superior to any other thus far. In all *essential* points they are superior to muzzle-loading rifles for active service. The only point in which any muzzle-loader has the superiority, is with those in which the ball takes the groove, and finds its centre while being rammed down.”

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#### MERRILL'S PATENT BREECH-LOADING RIFLE.

The annexed illustrations, being a representation of a sporting rifle of this pattern, and of two por-

MERRILL RIFLE IN POSITION FOR LOADING.



MERRILL RIFLE IN POSITION FOR CLEANING.



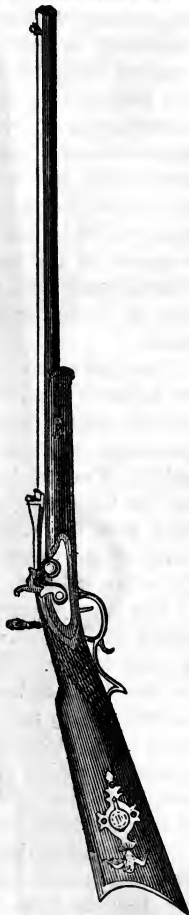
tions of the military rifle, showing MERRILL SPORTING RIFLE. very clearly the peculiarities of its construction, will enable the reader to get a very distinct conception of its appearance and mode of use.

I have not had an opportunity of testing it, but have formed a favorable opinion of its powers from the representations of reliable persons who have tried it.

I annex a description of the gun, and also several letters, selected from a multitude published in the advertising pamphlet of the company.

The Merrill Patent Firearm Manufacturing Company, in offering their arms to the public, take this means of informing those not acquainted with the arms of their manufacture, that the Merrill rifle is the result of a great deal of experiment by the inventor, "Mr. James H. Merrill, of Baltimore," whose vast experience and long practical study in the manufacture of arms, both in America and Europe, has enabled him to give to the world this great improvement in small arms, which classes him among the most prominent of modern inventors.

The simplicity and strength of construction arrived at in



the Merrill rifle, are only equalled by its extraordinary range and accuracy of fire; and the efficiency of the arm not being dependent on any patent *metallic* or *india-rubber* cartridge case, but using the simple paper cartridge, or loose powder and ball, and the ordinary percussion cap (to be had at any country store or trading station), gives them great advantages over arms depending on fixed or regularly prepared ammunition, and makes them justly preferred, not only on the frontier, but wherever a rifle is required. Having been approved of by the United States Government, after being subjected to the most severe tests by both the Army and Navy Departments, and both having ordered them for service, it is with entire confidence they are offered to the public.

Another advantage the Merrill plan possesses is, that it can be easily applied to muzzle-loading arms at a small cost, without restocking, altering the lock, or changing the general appearance, or diminishing the strength of the arm. The alteration of muzzle-loaders to the Merrill plan of breech-loading, has been practically tested by the United States Government with the most entire success, and has placed in the hands of the troops an arm that cannot be surpassed, and also at a small cost.

For sporting purposes or target shooting, the Merrill rifle cannot be equalled, as it has attained the highest perfection in every respect. The barrels are of the best material, and the chambers are bored out to the exact size of the conical ball which they use, so that the plunger which puts the cartridge in its place forces the point of the ball firmly into the grooves or rifling of the barrel, thereby ensuring its going straight to the mark, and not turning, as conical balls frequently do, when fired from other rifles.

The sporting rifles are fitted with globe sights of the most approved pattern, which ensures fine shooting. These rifles have been fired *five hundred times* without cleaning, and *any number* of shots can be discharged without any change taking place in the working of the machinery. This is owing

to there being no escape of gas, which, when escaping, causes what has been termed *clogging* in other breech-loaders, but which can never occur with the Merrill rifle, as the plunger or breech-pin is reamed out so as to make an expansive spring, and the cavity being filled up with copper, upon which the force and heat of the explosion act at the moment of discharge, causes the plunger to expand as much as the barrel will allow it, or, in other words, to keep up with the expansion of the barrel or surrounding surfaces, and thereby prevent escape of gas, which not only clogs up the working parts of a gun when escaping, but causes great loss of power. Thus, no gas escaping from the Merrill rifle, accounts for its having more penetration than other breech-loaders. Attention is respectfully called to the recommendations on the following pages, and any further information will be given, on application, by mail or in person, to the Merrill Patent Firearm Manufacturing Company, Baltimore, Md.

*Letter from Major-General JOHN A. DIX, Commanding Middle Department.*

FORT McHENRY, October 5th, 1861.

Messrs. MERRILL, THOMAS & Co.

GENTLEMEN :

I have given a thorough trial to your "Breech-Loading Carbine," and I have seen no arm of this description which I like so much. It is easily and rapidly loaded, is perfectly safe, shoots well, with great accuracy, and is of long range. I doubt if there is any arm which combines all these advantages in the same degree. I have also tried your rifle, constructed on the same principle, and it seems to me to merit the same praise ; and I wish those you have on hand could be obtained for some of the companies under my command. I made a requisition for 1,000 to arm the Fourth Wisconsin Volunteers.

\* \* \* \* \*

With my very best wishes for your success,

I am, respectfully, yours, Jno. A. Dix.

*Extract from a letter from A. C. GILLEM, 1st Lieutenant, 1st Artillery, U. S. Army.*

FORT BROWN, TEXAS, August 9th, 1860.

MY DEAR SIR :

\* \* \* \* \*

Now as to the gun, or, rather, rifle, it has been my constant companion for nearly two years. I have used it in all seasons, and in all kinds of weather; in fact, I have never marched without it, and during that time it has never failed, either firing or in the mechanism. I can fire it five times to any man's four, with Sharps', and I find it very easy to make the cartridges. Have any of them been ordered by the Department? get the Secretary to order fifty, and I think the report of any cavalry officer would be favorable. I prefer them infinitely to Sharps'; neither of mine, carbine or rifle, has ever been out of order. I only wish I had brought out a sporting rifle of about sixty balls to the pound (round ball weight). I shall be happy to hear from you, and of your success.

Yours sincerely, A. C. GILLEM.

JAS. H. MERRILL, Esq.

*Letter from Captain JACOB HESS, 21st Regt. Indiana Volunteers.*

HEADQUARTERS, 21ST REGT. INDIANA VOLTS., }  
FORT MARSHALL, BALTIMORE, January 17th, 1862. }

Messrs. MERRILL, THOMAS & Co

GENTLEMEN :

My company having armed themselves with your "Breech-Loading Infantry Rifle," I challenge the world to compete with them, using any other weapon. A target placed at the distance of one thousand yards or under, is riddled to atoms by a squad of six or eight men at every fire. I have tested the qualities of your rifle until I am satisfied it merits all the praise bestowed upon it. The facility, rapidity, and ease with which it can be used, have no equal. The ingenuity and simplicity which celebrate your gun far supersede any that



has come under my observation. Let the noble men of the gallant Twenty-first sum up their interests as to what they need to sustain their honor in this deplorable war, and equip themselves with the "Merrill Breech-Loading Rifle," and then they can laugh at opposition.

In conclusion, permit me to say, I hope, that you will regard my foregoing recommendation in the same light that it is meant.

I am your obedient servant,

JACOB HESS,  
Captain Co. K, 21st Reg. Ind. Vols.

*Letter from J. U. SHALER, Esq., Inventor of the  
"Shaler Sectional Bullet."*

BROOKLYN, N. Y.

MESSRS. MERRILL, THOMAS & Co.

*Baltimore, Md.*

GENTLEMEN :

In testing the qualities of the "Merrill Breech-Loading Rifle," by firing my sectional bullets, my expectations are more than realized. Your rifle makes better hitting, and at a longer range, and with less powder, than any arm I have ever used, either muzzle or breech-loading. My sectional bullet weighs 700 grains, and your carbine fires them with 40 grains of powder, of the regulation grade, a result which I have never been able to accomplish with any other arm. The objection I have heretofore had to breech-loading arms is overcome by the use of yours, for there is no escape of gas at the breech, and the adjustment is simple and perfect, which is a valuable consideration to the soldier and also sportsman. It is not so much trouble to keep your breech-loader in order as it is the muzzle-loaders.

Being satisfied by actual demonstration that your breech-loading rifle possesses all the qualities to make it good, and efficient for the different purposes for which arms are used, I can cheerfully recommend it to the public.

I am, respectfully, yours, J. U. SHALER,  
625 Pacific street, Brooklyn, N. Y.

## ASHCROFT'S RIFLE.

This gun has not yet been manufactured for sale, and it seems doubtful whether the proprietors of the patent will succeed in their efforts to secure the capital necessary for an enterprise involving such an expenditure of time and money as is essential to the production of any gun in large quantities.

Yet I have had such convincing proof of the excellence of the weapon for a military arm, that I should consider my work incomplete without a description of the gun and a statement of its powers.

The breech-block is constructed with a cylindrical gas-check, which enters the breech of the barrel, and shuts against a shoulder, and this gas-check being slightly concave in its external form, the effect of the explosion is to straighten and thereby to lengthen it, so as to press it against the shoulder and effectually to prevent the slightest escape of gas. The proof that it does so, is afforded by the fact that I have myself fired the gun 300 times, and afterward saw the same gun fired 500 times in succession, without cleaning, and the working of the parts was as easy at the last as at first, and the gas-check itself remained as bright and unsullied as before it was used, which could not have been the case had there been any escape of gas.

The motion of the guard for opening the breech

is the same as in Sharps', but the effect is to withdraw the breech-block by a backward movement, the facility of which could not be affected by the clogging of the parts were they to become foul.

The whole arrangement of the working parts is admirably simple and effective, and no breech piece of solid metal could be more safe or unyielding than this, when fixed in position, and by a very simple arrangement, it is impossible to fire the gun till this position is attained.

I have twice acted by invitation as one of a committee to test the powers of this gun, and had also one of them in my possession for a considerable time, during which I subjected it to a very great variety of experiments, and have always expressed the opinion, to which I still adhere, that it is the best gun of the kind that has yet been produced. In range and accuracy it is equal to the best muzzle-loading military rifles, and I know of no objectionable feature either in its action or appearance. In a comparative trial of penetration with Sharps' rifle which I witnessed, it proved superior at *every* shot, and after ten shots with each, the average penetration of the Ashcroft was found to be an inch more than that of Sharps' rifle, though the cartridges were taken indiscriminately from the same package.

## GREENE'S RIFLE.

This arm was patented by Lieut.-Col. J. Durell Greene, U. S. A., November 17th, 1857, and is now manufactured at Worcester, Mass.

As the manufacture was begun some years before the commencement of the troubles which have caused so great a demand for arms at home, a market was sought for it abroad, and certificates of its efficiency and excellence of the very highest character are given in the advertising pamphlet from English, French, and Russian officers appointed by their respective Governments to test and report upon its capacity. The French committee of which M. Minié was at the head, report that "There was not the least difficulty in charging; not the least fouling at the breech or chamber; and no escape of gas apparent. The arm is manipulated with the greatest facility, and in its whole fitting up and keeping is convenient both for the bivouac and for soldiers little experienced. The whole is very solid, and not liable to get out of order by firing or by the jolting of the horse, or on the march. The charging is rapid and easy, and without any danger to the soldier, and the cartridge is very easy to make."

The reports of committees of officers of the English and Russian service correspond with this, and a contract had been entered into with the latter

Government for the delivery of 3,000 of the guns before the commencement of our domestic troubles.

The gun is a breech-loader, and is constructed on a principle entirely different from any other I have described. A cylinder of iron containing a breech-plug which slides backward and forward within it, is inserted at the breech of the barrel, and moved forward by a projecting knob, which moves in a slot on the top of the barrel, till it closes the breech, when it is turned to the right and secured in place by shoulders. The knob is held by a catch, which may be loosened by pressing a pin at the breech of the barrel. The hammer is on the under side, in front of the guard, and the nipple is so arranged that the fire is first communicated at the forward end of the cartridge, thus insuring the ignition of all of the powder. The cartridge has the bullet in its base, with a greased wad between it and the powder, which, with the bullet, packs the joint perfectly at every discharge, and prevents the slightest escape of gas. After each discharge, this bullet is pushed forward by the breech-plug to the end of the chamber, the cylinder is then drawn back, and the cartridge inserted in the slot which is thus opened. The cylinder is then pushed forward pressing the cartridge before it, and the knob being turned to the side and the nipple capped, the gun is ready to fire. The movements are perfectly sim-

ple, and all the parts are strong, and well adapted to stand the rough usage of military service.

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#### THE LANCASTER SYSTEM OF RIFLING.

As this is the only gun manufactured in this country on the Lancaster system of rifling, it may be interesting to devote some space to a consideration of its merits. Its peculiarity consists in the fact that, instead of being grooved, the bore is elliptical in shape, and the rotary motion is imparted to the bullet by giving the longest diameter of the ellipse a turn of three-fourths in the length of the barrel. The oval form is too slight a variation from a perfect cylinder to be perceptible to the eye, and the appearance of the barrel, on looking through, is precisely like that of a smooth-bore musket. But by placing one of the bullets (which are cast round, and assume the elliptical shape on entering the barrel) into the muzzle, and looking through from the breech, a slight crescent of light will be perceived on each side of it.

During the past year, an exceedingly interesting series of experiments have been tried by a committee of the Ordnance Department of Great Britain on the merits of different systems of rifling small arms, beginning with five patterns of Enfield rifles, constructed with different numbers and degrees of

twist, and then selecting the best of these, and comparing with it the Lancaster and Whitworth rifles. It is worthy of note that the Enfield rifles with five grooves were found to be decidedly superior to those which had only three, and for long ranges, or in windy weather, a twist of one turn in 48 inches gave much better results than one in 63, though it was more liable to foul. The following are the conclusions arrived at in regard to the Lancaster, as compared with the Enfield :

“ As regards precision when cleaned, the Lancaster has the advantage.

“ As regards precision when foul, the Lancaster has a decided advantage.

“ As regards non-tendency to accumulate fouling, the Lancaster is considerably superior.

“ As regards simplicity of management, the Lancaster has the advantage,—a smooth barrel being more easily cleaned than a grooved one.

“ As regards penetration, about equal.

“ As regards trajectory, the Lancaster has the advantage.”

A comparison was then made of small-bore Lancaster and Enfield rifles, with the Whitworth and Westley Richards breech-loader, rifled on the Whitworth principle, and the Lancaster proved inferior to the Whitworth and Enfield, and the committee remark that—

“A tendency to throw occasional wild shots was observed in the Lancaster small bores, which was not the case with large bores on the same principle.”

This was attributed to an incomplete expansion of the bullet, which in the large bores is overcome by the larger cavity at the base of the bullet.

They finally placed the small bores “with grease lubrication,” in the following order of merit:

PRECISION WHEN CLEAN.

1. Whitworth.
2. Lancaster and Enfield equal.
3. Westley Richards.

PRECISION WHEN FOUL.

1. Whitworth.
2. Lancaster.
3. Westley Richards.
4. Enfield (short barrel).

NON-TENDENCY TO FOUL, SO AS TO OBSTRUCT LOADING.

1. Westley Richards.
2. Whitworth.
3. Lancaster.
4. Enfield (short barrel).

Experience having proved, however, that the “best lubricant for all climates and conditions is pure bees’ wax,” they found, on trying the same arms with bullets thus lubricated, that “the shoot-



ing of the Whitworth and Enfield arms deteriorates, while that of the Lancaster rifle improves to a degree which renders its precision equal to that of the Whitworth and Enfield, when fired with grease lubricant."

And finally, "A strict and impartial comparison on all points connected with military efficiency, establishes the superiority of the Lancaster rifle," and "the committee are of opinion, should it be decided to retain the present Enfield caliber, that the adoption of the Lancaster system of rifling will be attended with considerable advantage to the service."

The application of the breech-loading system to this principle of rifling, is, I believe, peculiar to Greene's rifle. The arrangement for this purpose is certainly as simple and effective as any that I have seen. I believe the gun has thus far been manufactured solely for military purposes, and I perceive, on inspection, but three points which would suggest to my mind a question as to its adaptation to such use, which are, first, the projecting knob by which the bolt or rammer is withdrawn and replaced; second, the position of the hammer on the under side of the barrel, in front of the guard; and third, the danger of the breech-plug and cylinder becoming clogged with dust, so as to slide with difficulty.

When in position for firing, the knob projects at

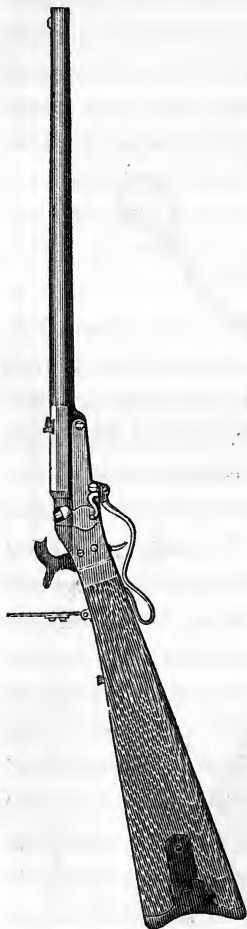
a right angle an inch and a half from the side of the breech of the barrel. For the sportsman this would be objectionable, on account of its liability to catch in bushes, though no injurious consequences could ensue therefrom; but to my taste a more serious objection would be its unsymmetrical appearance. The position of the hammer is not without important advantages. It is much less liable to cause accident by being caught upon anything in carrying or struck by an accidental blow, than in the usual position. The nipple is better protected from rain, and is so placed as effectually to guard the hand from flying fragments of the cap. On the other hand, the manipulation seems less convenient than the common method, and the gun must be turned with the guard upward to put on the cap. The slot on the upper side of the barrel, being always open while the gun is in use, I should suppose, would be liable, at times, to become clogged with dust, so as to interfere with the easy motion of the cylinder. Whether these objections are of sufficient importance to counterbalance the obvious merits of the gun, is for military men to decide. The fact that the inventor is a thoroughly educated officer of the regular army, proves that he, at least, does not consider them such. The accuracy of the one I tried would by no means have satisfied a sportsman, but the gun is intended only for military use, and is suf-

ficiently accurate for troops of the line. The trajectory is lower than Colt's or the Spencer rifles. The bullets invariably preserved their position, and struck point first, and the force was very great. The hammer was almost invariably blown to half cock by the discharge.

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#### THE MAYNARD RIFLE.

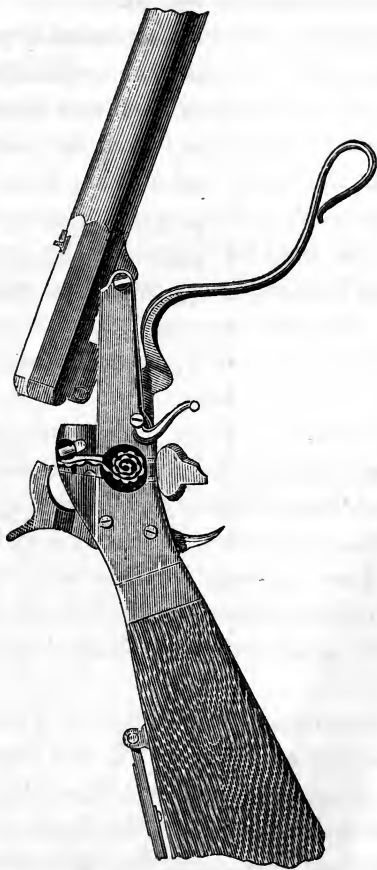
The Maynard rifle, which was first patented in 1851, and of whose peculiar construction a very good idea may be obtained from the annexed representations, was invented by Dr. Edward Maynard, of Washington, D. C., and is certainly one of the most ingeniously contrived instruments of the kind which have yet been produced. Indeed, it combines so many ingenious arrangements, which together result in the production of a weapon whose efficiency and strength are quite as remarkable as its perfect simplicity, that it is only by a careful examination and study of its various parts and their workings, that one can properly estimate the amount of brain-work involved in its construction. The fact which first presents itself, upon a cursory examination, is that of its extremely compact form, in which every feature is reduced to the smallest possible occupation of space, without giving the slightest ground for any apprehension of deficiency in



MAYNARD RIFLE.—Fig. 1. Showing Rifle loaded, cocked, and with back sight raised.

strength. The motion of the guard by which the breech is raised for the reception of the cartridge, is so easy, that the first feeling which it excites is one of doubt, lest an accident should cause its displacement at a moment when mischievous consequences might ensue. But an examination of its working reveals the fact that the mechanical arrangement of its joints is such as to insure the strength of a solid mass of steel, which is not affected by any strain to which it can possibly be exposed, and that this is attained without the use of a single spring, bolt, or catch, but simply by the movements of the parts, which work with mathematical precision, and de-

rive their strength from their relative positions,



**MAYNARD RIFLE.**—Fig. 2. *Showing Rifle in position to receive the cartridge, and with the magazine also opened, showing the primer.*

which may be compared to those of the supporting bones in the animal system.

A very simple but very important improvement has been recently introduced, by which the empty cartridge, after being fired, is started from its place by the act of raising the breech for reloading, so that it may be easily withdrawn. This is one of those apparently trifling arrangements, the value of which can only be appreciated by one who has seen a deer bounding away from him, while he was fumbling with his finger-nails to start a cartridge which happened to stick, as such things always *happen* to do at such times.

The removal of a single pin disconnects the barrel from the stock, and the whole gun may then be packed in a space of twenty inches in length, by six wide and one inch deep, so that it may be carried in a trunk, or an easily portable case. Barrels of different calibers, either for shot or rifled, may be fitted to the same stock, and changed in a few seconds.

The ammunition is contained in a metallic cartridge, having an aperture in the base through which the fire is communicated from the cap. As these cartridges constitute a very important feature of Dr. Maynard's invention, they demand something more than a passing notice. Theoretically, the charge delivered from a metallic cartridge should

be more certainly accurate than that from one of paper or cloth, and especially in breech-loading guns, where the cartridge rests in a chamber, from which the ball is driven through the caliber which is of less diameter. For, supposing the point of the ball to be entered perfectly true in this caliber, its base, when a paper cartridge is used, is unsupported at the moment of explosion, and may be turned to one side or the other by the unequal pressure exerted by the gas. With a metallic cartridge, provided the ball is fitted perfectly true in the end, and the cartridge is made to fill the chamber, the base of the ball is held in its place as firmly as the point till the whole has entered the rifled caliber. The ordinary self-exploding metallic cartridges are compressed about the base of the ball after its insertion, which would seem to involve a risk of untrue delivery, owing to unequal friction upon the base while forcing itself loose. In practice, however, I have certainly found no cause of complaint on this score. Dr. Maynard's cartridges are constructed in such a manner that when charged, by means of a very simple implement which accompanies every gun, the ball is not only, of necessity; mathematically exact in its position, but is held, *without compressing the cartridge*, but simply by being exactly fitted to it, so firmly, that it cannot be moved after being placed in the chamber, in any direction ex-

cept with a perfectly true delivery through the caliber. The cartridges may be used over and over again for an indefinite period, and being loaded by the gunner himself, he is relieved from the apprehension of being unable to provide himself with ammunition, as well as from the fear of accidental explosion, which must always exist with the cartridges having the fulminating composition in contact with the powder. There is, also, a very simple arrangement for using loose ammunition, the ball being first inserted at the breech, and followed by a cartridge or charger, which is simply filled from the flask for each shot. I have been thus particular in describing the Maynard cartridge, because its merits, which are really very important, are liable to be overlooked by a casual observer, and because Dr. Maynard is entitled to the full credit of its invention, having obtained a patent for his mode of manufacturing them, and securing the bullet with a flat base, in a perfectly true position in the cartridge, and holding it there without compressing the cartridge about its base, as long ago as 1856.

The barrels are of two sizes, one being of half an inch caliber, carrying 20 elongated or 35 round bullets to the pound; the other, of  $1\frac{3}{16}$  inch caliber, carrying 46 elongated or 90 round bullets to the pound. To the latter I am ready to accord the fullest praise. I know of no breech-loader which I



consider its superior ; and, indeed, in accuracy and force, I have never seen it surpassed by any gun fit for field service.

Of the large barrel, I cannot speak in the same terms. It is too light for the charge it has to carry, and the recoil is so severe as to neutralize the effect of the increased charge, so that its penetration at 40 yards is little, if any, more than that of the small barrel whose charge is one-fourth less.

In the shaping of the stock, the object of reducing the whole to the most compact form possible, has led to a sacrifice of fulness, which gives it a lank appearance, as if sawed from a board, which, I think most men will agree with me, is by no means atoned for, by the capacity it gives of being stowed in half an inch less depth of case. A new model, however, has recently been prepared, in which this objectionable feature has been removed, and it is to be hoped that in future its beauty of form will be in keeping with its intrinsic excellence.

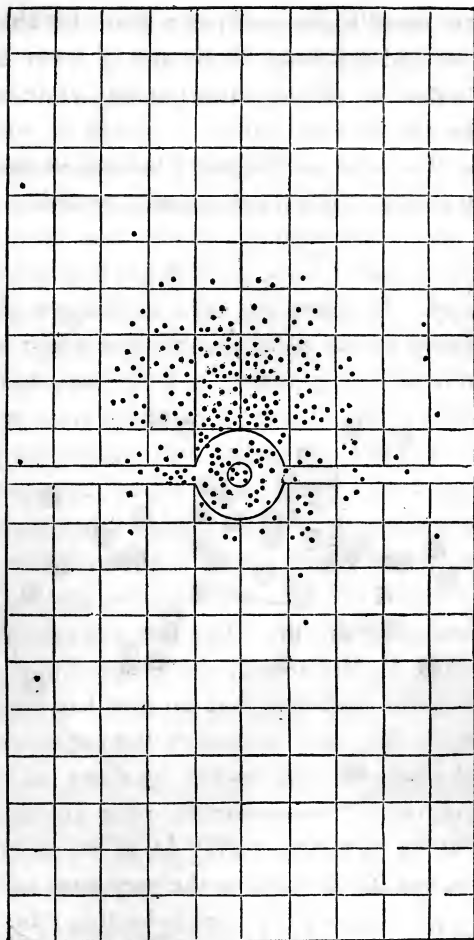
In connection with this gun, I ought not to omit to mention the Maynard primer, which is another invention of Dr. Maynard's. It consists of a narrow strip of varnished paper of double thickness, having deposits of fulminating powder in cells between the two, at equal distances apart. Each strip contains three dozen of these cells, equivalent to the same number of caps. The strip is coiled in a magazine

concealed beneath the lock-plate, and brought up by the motion of a wheel in the act of cocking, so as to bring a cell directly upon the top of the nipple. The fall of the hammer explodes it, and at the same time cuts off the paper behind, so that it is not seen again till the gun is again cocked.

My own experience in its use has been but small, but, so far as it has gone, it has been entirely satisfactory. It secures the same advantages which are possessed by the metallic cartridges which have the fulminating composition in their base, without being liable to the danger of explosion from an accidental blow. The rapidity with which the gun may be used with its aid, is proved by the anecdote I have elsewhere related of a fishhawk having been killed on the wing after being frightened from his perch by a shot which missed him, the gun having been reloaded meanwhile. This feat was performed by Mr. Wm. P. McFarland, of Chicopee Falls.

I am quite confident that no gun has done so much as the Maynard to remove the prejudice entertained against breech-loaders by many old riflemen; and indeed no sportsman, after convincing himself, as he may very readily do, of its accuracy and force, can fail to perceive the very great advantages it possesses over any muzzle-loading rifle.

The target, of which the annexed is a representation, was shot by Mr. Wm. P. McFarland at 500

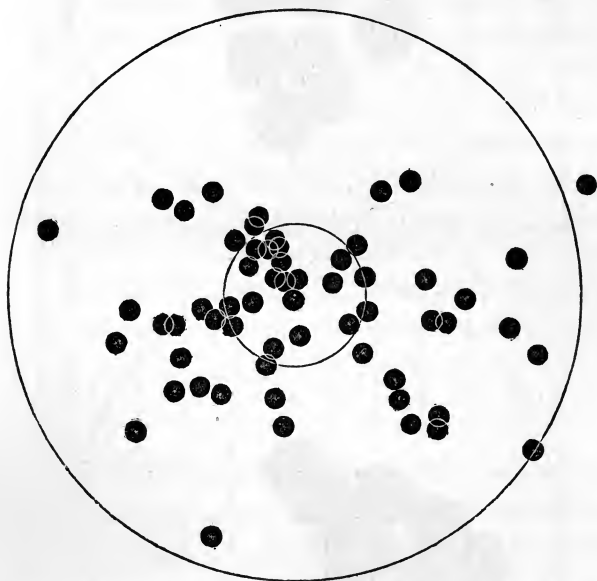


Size of Target 10 feet by 20 feet. Distance 500 yards. Number of rounds 250. *All struck.*  
 NOTE.—It will be observed that *four-fifths* of all the shots are included within a space of four feet square.

yards, and a very important proof afforded by it of the accuracy of the gun, lies in the fact that the

whole number of shots was fired without his knowing, till he had finished, where any of them had struck, so that no allowance was made in any case for previous variations.

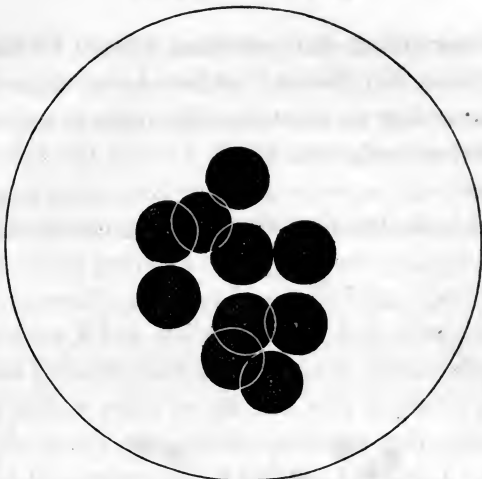
I give also representations of three other targets, shot with the Maynard rifle: one of sixty successive



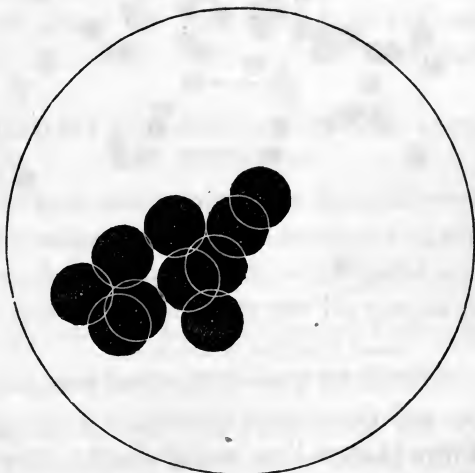
Sixty successive shots at 100 yards, with Maynard rifle, fired without being cleaned, by Mr. WM. P. MCFARLAND.

Diameter of outer circle, 12 inches; inner, 3 inches.

shots by Mr. McFarland; and two, of ten shots each, at fifty yards, by Mr. Cyrus Bradley, of Cooperstown, N. Y.



Ten successive shots at 50 yards, with Maynard rifle, .35 caliber, by  
Mr. CYRUS BRADLEY.



Ten successive shots at 50 yards, with Maynard rifle, .35 caliber, by  
Mr. CYRUS BRADLEY.

Since writing the preceding, I have received a letter from Mr. Stabler (to whom I am indebted for the interesting essay on the rifle which is published in this volume), from which I make the following extract :

“I took my rifle with me on my recent trip (to the Alleghany mountains), and having pretty much got through my business, I took an afternoon hunt. A light snow had recently fallen, and I soon came upon the tracks of a couple of deer, which I followed for a mile or two, coming on them within 50 or 60 yards, they standing within 3 or 4 feet of each other. I dropped the first in his tracks, and before the second had moved 25 yards, I had reloaded and knocked him down also. So much for the Maynard rifle.”

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#### RIFLES USING THE SELF-EXPLODING METALLIC CARTRIDGES.

I have discussed the merits of this form of ammunition in a previous chapter, and propose now to give such a description of the best rifles adapted to its use, as may aid the purchaser in making a selection.

The demand for guns of this kind is rapidly increasing, and the obvious advantages they possess, will always be more than enough, in the eyes of a large class, to counterbalance any objections which

may be urged against them. Their relative merits depend first upon their comparative accuracy and force; and, secondly, upon the construction of the movable breech-piece, by which the barrel is opened for the admission of the cartridge. As the efficiency of the weapon is greatly dependent upon the facility with which the operation of withdrawing the empty cartridge and inserting the new one may be performed, it is obvious that the arrangement of the parts therewith connected is a matter of vital importance.

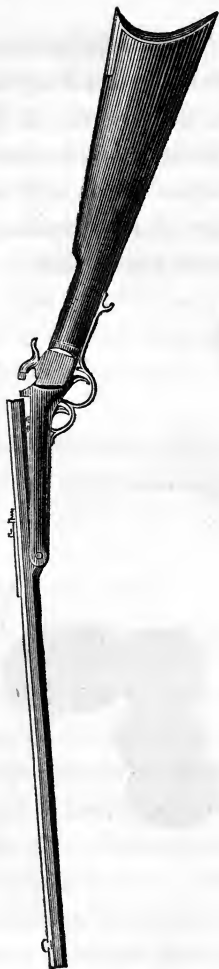
I proceed first to describe the guns which are loaded with a single cartridge, and must be recharged for every shot.

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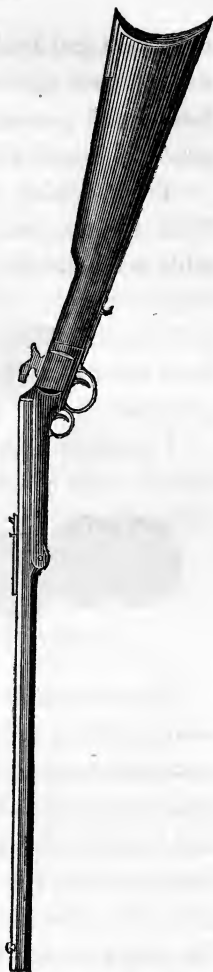
#### F. WESSON'S BREECH-LOADING RIFLE.

The advertisement at the end of this volume sets forth the merits of this gun in terms which my own experience in its use, and the opinions I have heard in regard to its merits from competent judges, lead me to believe, are not exaggerated. For accuracy and power I have found it superior to any gun of its size using the self-exploding cartridge. The name of the maker, who was formerly associated with his brother, the late Edwin Wesson, of Northboro', is so well known in connection with

Wesson Rifle in position for loading.



Wesson Rifle ready to fire.

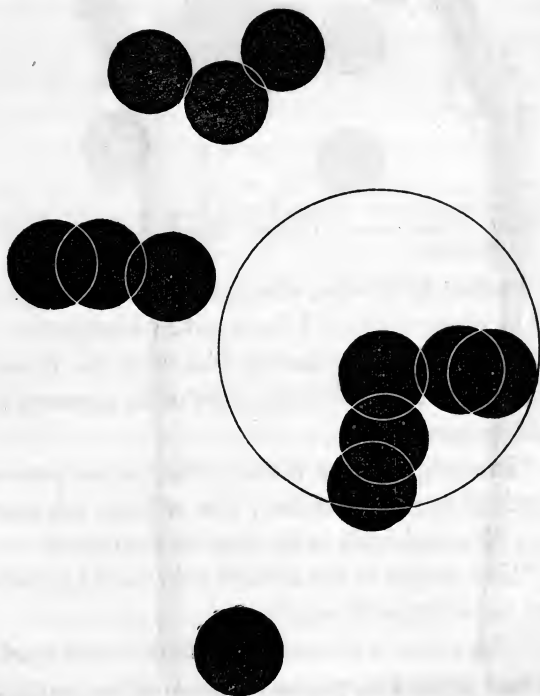


the best of work in the manufacture of target rifles, that it is in itself a sufficient guarantee for the ma-

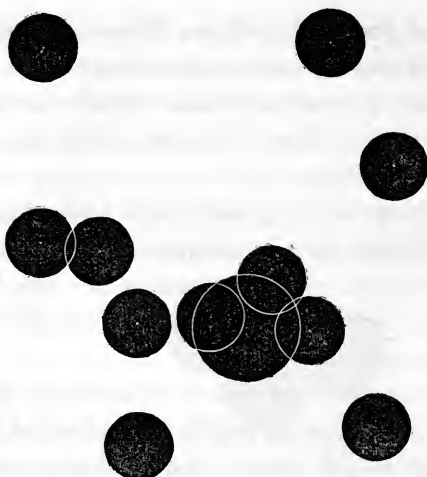


terial and finish of whatever comes from his shop, and the compact and graceful form, and beautiful finish, and general attractive appearance of this gun, fully sustain the reputation he has acquired.

The following account of experiments with the Wesson rifle, and a comparison of its penetration with the Ballard, was furnished me by Dr. I. J.



Twelve successive shots. Weapon, Wesson's breech-loading rifle, 28-inch barrel. Distance, 115 yards. Open sights. Shot by Dr. I. J. WETTERBEE.



Twelve successive shots. Weapon, Wesson's breech-loading rifle, 34-inch barrel. Distance, 20 rods = 110 yards. Telescope sights. Shot by Dr. I. J. WETHERBEE.

Wetherbee, of Boston, who has tried it thoroughly, and in whose opinion I have entire confidence. I give also two targets shot by him with the Wesson rifle, which afford sufficient proof of its accuracy for sporting purposes.

"The weight of the Wesson rifle was six pounds. Length of barrel, 24 inches ; size of bore,  $\frac{3}{16}$  ; carrying 90 round balls or 64 slugs to the pound.

"The weight of the Ballard rifle was  $6\frac{1}{8}$  pounds. Bore the same as Wesson's.

"The above is the weight of barrels and stocks. I should judge the weight of the Wesson barrel to be  $3\frac{3}{4}$  lbs., and the Ballard barrel  $4\frac{3}{4}$  lbs.

“The penetration of the Wesson at a distance of 32 feet was  $8\frac{1}{2}$  inches, in pine wood.

“The penetration of the Ballard in the same wood was  $7\frac{1}{8}$  inches. The same cartridges were used in both rifles.

“Five shots were made with each rifle. One of the Ballard shots penetrated half an inch deeper than the other four by the same gun. The Wesson rifle made the sharpest report; so decided by two witnesses present.

“At a subsequent trial of three barrels made by Wesson, the following results were obtained, viz.:

“The 24-inch barrel which I have mentioned above, penetrated  $8\frac{3}{4}$  inches in pine, the boards being placed together compactly.

“The 28-inch barrel penetrated  $10\frac{1}{4}$  inches.

“The 34-inch barrel penetrated 12 inches and a fraction. The same cartridges were used in the above three cases.

“The only explanation I can give of the greater penetration of the 24-inch barrel of Wesson's over Ballard's is that the Wesson rifle slugs the ball more, thereby expending more of the strength of the powder.

“You will see also that the 28 and 34-inch barrels have a decided superiority over the 24-inch barrel.”

At the Missouri State fair on the 7th October,

, the Wesson rifle won the prize (a stand of colors) in a contest with three infantry companies. The target was the size of a man, distance 300 yards. The Wesson rifle hit the target forty-five times out of 100 shots, the greatest number by any other gun being thirteen hits. At the Massachusetts State trial of breech-loading arms at Readville, the Wesson rifle placed 20 successive shots in the target at 200 yards, and in testing its powers of rapid firing, 50 shots were fired in less than four minutes.

In loading the Wesson rifle, as may be seen in the illustration, the breech is elevated by a movement somewhat like that of the Maynard. The empty cartridge is then withdrawn by hand, a new one inserted, and the barrel restored to its place, in which it is held by a catch, which is loosened by a trigger in front of the one by which the piece is discharged. The hammer cannot be drawn back beyond half cock till this catch has secured the barrel in its place.

#### THE BALLARD RIFLE.

This rifle is manufactured of different sizes, for military and sporting purposes. The former is so arranged that it may be used with the metallic cartridge or with the ordinary soldier's cartridge, to be fired with a cap. The sporting rifle is of  $\frac{44}{100}$  cali-

ber. I have tried the latter, and was satisfied with the accuracy of its shooting, though the sights had not been arranged, and I had not time to adjust them for different ranges. I think it would shoot every shot into a six-inch ring at 100 yards, and probably maintain the same degree of accuracy in calm weather up to four or five hundred. The experiments of Dr. Wetherbee with the Wesson gun in comparison with this, prove the superior force of shooting of the former, and I have myself made the same proof,—having procured a box of cartridges made for the Ballard rifle, and using them indiscriminately in that gun and the Wesson, have found the average penetration of the latter to be about an inch more than the former. The difference in the velocity of the shot from the Ballard rifle, as compared with others, is plainly perceptible, when standing by the target,—a mode of judging the capacity of a gun, which should never be omitted in a comparative trial. Standing within twenty feet of the target, when the shooter is 100 yards distant, the whistle of the bullet from the Ballard rifle is distinctly heard, and the time is appreciable between the report of the gun and the striking of the bullet. Such is not the case at that distance with the Colt, Maynard, or Wesson rifles. No whistling can be detected, and the stroke of the bullet upon the target is simultaneous with the re-

port. With the Maynard the same is the case at 200 yards, but the Colt has by that time lost a portion of its velocity, and the report is heard before the bullet strikes, though the interval is so slight that it is scarcely appreciable. I am not prepared to say how far the accuracy is dependent upon the velocity. I have never been able to do as good continuous shooting at 200 yards with the Maynard as the Colt, but others in whom I have confidence have reported differently. One of the best riflemen I have ever known has assured me of his firm conviction, that a bullet moving with only moderate velocity is less affected by wind than one which was driven with very great speed.

The breech of the Ballard rifle is opened for the insertion of the cartridge, by drawing down the guard, when the breech-block sinks perpendicularly, carrying the hammer with it, and throwing it back to half cock. The empty cartridge is then removed by means of a finger-piece under the barrel, attached to a slide, which pushes out the cartridge by pressing against its flange, and is then restored to its place by a spring. This is a better arrangement than the Wesson, from which the cartridge must be withdrawn by the fingers, which is sometimes difficult, and causes delay.

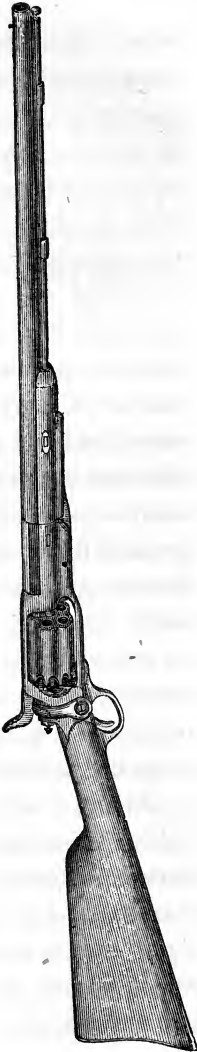
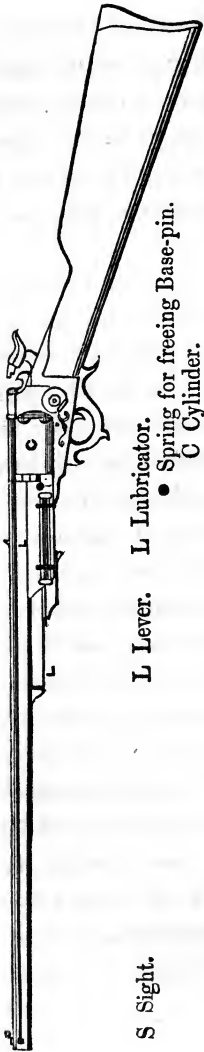
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## REPEATING RIFLES.

I have elsewhere given my opinion of the general merits of rifles of this description, and it only remains to speak of the relative value of the different models, of which I know of only three, viz.: Colt's revolving rifles, the Henry, and the Spencer repeating rifles.

## COLT'S RIFLE

is constructed on the same general principle as his pistols. A revolving chamber receives the charges, which may be either loose powder and ball, or cartridges; a rammer which is moved by a lever, insures their being sent home perfectly true, and the balls fit so exactly to the bore of the chambers as to close them hermetically. The caliber of the barrel being  $\cdot 02$  of an inch less than that of the chambers, the ball is necessarily forced to fit itself exactly to the grooves, which are seven in number, and cut with a gain twist. The charge is fired with a cap, and the working of all the parts is beautifully simple and exact. The excellence of the material and workmanship of these guns require no setting forth at my hands, as the reputation of Colt's arms is established in all four quarters of the globe; but it may not be amiss to state the fact that I have in my possession one of his rifles which I have had in frequent use for more than two years, and from



COLT'S RIFLE.



which I have fired over three thousand shots, and it has never been in the least degree out of order, has never been in the hands of the gunsmith, and as evidence that it maintains its precision unimpaired, I may mention the fact that I have recently, with open sights, placed ten successive shots in a nine-inch ring, at 200 yards.

I find the apprehension to be very generally prevalent that these guns are unsafe, from the liability to accidental discharge of other chambers than the one which is in line with the barrel. This prejudice has arisen from the fact that such danger did exist with the first pattern of gun, but, as now constructed, such an accident may be said to be an impossibility. In all my experience I have never known an instance of its occurrence, nor do I believe it could be made to occur; and I know of no gun which is so safe when carrying, for if the hammer is let down (as it ought to be) upon the bridge between the nipples, there is no possibility of an accidental discharge.

Another objection which is brought against Colt's rifle, is the theoretical one that much of its force must be lost by the escape of gas between the chambers and barrel, to which it is a sufficient reply to state the fact that its penetration is superior to that of any gun using the same weight of powder and lead.

Frank Forester's criticisms on Colt's rifles were directed at the first model, and have no application to the improved weapon. He asserts, however, that any gun which admits the slightest escape of the "gaseous ignited fluid, at the moment of discharge, must speedily suffer from the wearing away of the metallic faces at the point of junction;" and speaking of Sharps' rifle, he says: "I cannot doubt that, after a few hundred shots, the efficiency of the weapon would be seriously affected by the burning away or melting of the metal." This is a very plausible theory, but it does not stand the test of practice, at least with Colt's gun, for after firing, as I have stated, over three thousand rounds from the one in my possession, an examination with a powerful magnifying glass fails to reveal the slightest evidence of abrasion, either of the barrel or the chambers.

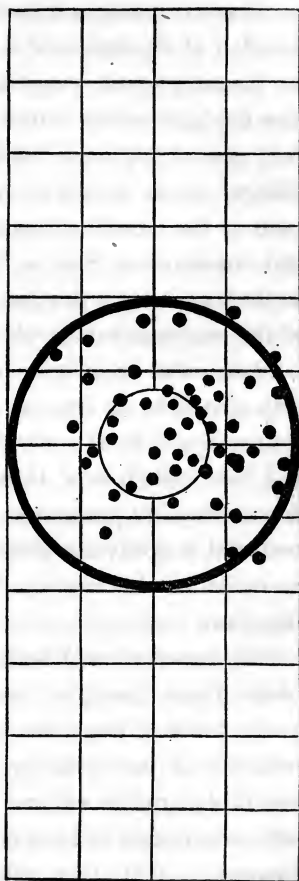
The annexed representation of a target shot by Lieut. Hans Busk, of the Victoria Rifles, at 400 yards, with Colt's rifle, affords such convincing evidence of its accuracy, that further testimony would be superfluous, and I need only add that my own experience fully corroborates his unqualified expression, that "for efficiency and strength of shooting, nothing can beat it."

Capt. R. B. Marcy, of the U. S. Army, in his "Hand-Book for Overland Expeditions," when

giving advice to prairie travellers on the subject of arms, speaks thus of these guns:

“For my own part I look upon Colt’s rifle as a most excellent arm for border service. It is the most reliable and certain weapon to fire that I have ever used, and I cannot resist the force of my conviction that if I were alone upon the prairies, and expected an attack from a body of Indians, I am not acquainted with any arm I would as soon have in my hands as this.”

To this I will add that I have never used any gun whose performance has proved so invariably satisfactory in all respects as Colt’s rifle.



48 shots. All hit. Target 6 feet by 2.  
Distance 400 yards.

Yet it is liable to some objections which are

peculiar to itself, and the importance of which in deciding the question of selection must be weighed for himself by each individual. It requires more time for loading than any of the breech-loaders. In fact, any of the single-shooting metallic cartridge rifles might be loaded and fired a dozen times while loading the six chambers of Colt's rifle. On the other hand, when they are loaded, the six shots may be delivered with greater rapidity than from any other gun except Henry's rifle, and for the sportsman's use the occasion would probably never offer (unless it were in chasing buffaloes), requiring the discharge of all the chambers without time to reload, and, as three charges may easily be inserted in the time required for once loading a muzzle-loader, it is obviously sufficient for his wants. The operation of loading can be greatly facilitated by using the cartridges, which are furnished by the manufacturers; but I find loose powder and ball to insure greater accuracy with ANY gun than can be attained with a paper or cloth cartridge. My own custom when using the gun is to reload after every two shots, and I adhere to it because I like to habituate myself to such a detail of manipulation as I conceive to be most efficient in continuous use. An emergency might of course occur, requiring the discharge of all the chambers without stopping to reload, but such emergencies are rare, and in con-

tinuous firing it is easier to load two chambers at a time, than to wait till the six are empty and then load them all; besides which, by thus breaking joints, the gun will not become heated so quickly, as if the chambers were fired in regular succession, and four charges will always be held in reserve, to be used only in case of emergency.

It is not so easy to clean as the metallic cartridge rifles, and is liable to be affected by rust and dirt in its working parts in a manner which would be objectionable to its military use. Except for cavalry, however, I do not believe that *any* repeater will ever be extensively adopted for military use; and the superiority for cavalry of the metallic cartridge guns, is too obvious and important to admit of rivalry.

I annex the following interesting extract from a letter to Col. Colt, from a correspondent at the Cape of Good Hope:

“As much discussion and writing is now going on in England, respecting the use and introduction of the numerous fire-arms, I have thought you would like to know what is going on here, at the Cape of Good Hope, where we have recently had a trial of Colt's and other arms, by putting them to a practical, useful test.

“On my recommendation, Mr. Chapman, one of our Central African travellers, whose name, coupled with his brother's, is well known in the geographical world, took with him, on his last expedition to the interior, one of your carbines (56-100ths caliber), which I selected from Rawbone's

Shop. I tried it here first, and found it carried admirably, both in accuracy and distance; I could reach 1000 yards easy.

"His brother, lately returned from the interior, tells me he heard of the wonders performed with the gun everywhere (he himself is still absent, when he returns we shall hear something more). He began to practise with it on board ship, going up to Walwich Bay, and used to pick off the sea-fowl as they flew past the vessel, with as much ease as he would have with a shot gun. At Walwich Bay, and among the hunters up there, he *beat every rifle brought against him*; and one shot, fairly calculated and deliberated, killed a pelican at 680 yards.

"One of your 8-inch pistols, stocked, was also in his hands, and afforded great fun to the hunters up there. They used to practise it at bottles at 150 yards, breaking four out of six, and never missing the candle-box placed behind them if they missed the bottles.

"The consequence of this is, that Mr. F. Green, the best elephant hunter we have, has just started to the interior, taking one of the rifles (a longer one) with him. D. Holden, who has just started, has had one of your large pistols stocked, and says he does not require any other weapon for game purposes. He tried it unstocked on his last trip, and says it even then answered to perfection, and declares he shall never stir without it.

"The other Chapman, who will also start soon again, will, I believe, take a rifle, and when we hear from these well known men the reports which, from my confidence in your weapons, I *know* they *must* bring back, I fancy we shall never hear of hunters starting for the interior without one."

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#### THE SPENCER REPEATING RIFLE, CARBINES, AND SPORTING RIFLE.

The Spencer Repeating Rifle is a new arm patented in the United States on the 6th of March, 1860, and in the

principal kingdoms of Europe at subsequent dates during the same year.

The rifle is a breech-loader and a repeater also. Seven cartridges are securely deposited in a magazine located in the butt of the gun. These cartridges are thrown forward to the chamber, as needed, with the most unerring precision, and with a rapidity for successive firing, which leaves nothing on that score to be desired. An ordinarily skilled marksman can discharge the seven loads in twelve seconds, and whole platoons of soldiers, waiting for the word of command, can fire with good aim at the rate of once every three seconds. When the seven charges are fired, seven more can be inserted in less than one-half the time required to *ram* and *cap* the single cartridge of a muzzle-loading musket. More rapid firing than this, even if attainable, would be wholly undesirable.

The great *desideratum* in a repeating rifle has been to locate the magazine so that the *reserve* cartridges should be absolutely protected against all danger of explosion. This end has been accomplished in the Spencer Rifle in the most complete manner, as even a superficial inspection of the arm will demonstrate. The magazine has a double sheathing of metal, strongly incased in wood, and thus presents as formidable an obstacle against external force as does the barrel itself. Indeed, it is averred, without fear of disproof, that the cartridges in the magazine of the Spencer Rifle, are, if possible, less liable to premature explosion from any conceivable cause than is the single cartridge of the ordinary kind in the chamber of a muzzle-loading gun.

One objection often and very justly urged against many breech-loaders, is the liability to an explosion before the breech is completely closed, in which event there is great danger of injury to the person handling the gun. By an ingenious, and yet very simple arrangement, such an accident is rendered literally impossible in the Spencer Rifle—for the plain reason that the hammer cannot be made to strike on the fulminate, nor on anything impinging thereon, until the parts are completely locked.

In *range* and *force* the Spencer Rifle is second to no other arm. It will throw a ball *two thousand yards*, and may be relied upon for general accuracy at a greater distance than any other arm yet invented. In the hands of scouts or sharpshooters, or regular troops,—taking into consideration all the elements of range, rapidity of firing, and facility of re-loading, the Spencer Rifle is so effective as to render one man with it fully equal to half a dozen men armed with single-loading muskets. In *force* it is quite as remarkable as in *range*. At the distance of one hundred and fifty feet it will propel a ball through thirteen inches of timber, and this force is not palpably diminished in intensity until the range is very considerably prolonged. The range and force herein described, are attained with a charge of powder but little more than one-half the quantity used in the regulation cartridge of the United States service, to propel a ball of the same size. This great gain results from the perfection of mechanism, which prevents the slightest escape of gas, and thus concentrates and economizes the entire force of the powder. So completely is the escape of gas checked, that a white handkerchief placed round the joint, when firing any number of times, is found not to be discolored, and not even to have the odor of powder.

The rifle has been submitted to the judgment of some of the most eminent Ordnance officers of the Army and Navy of the United States, and has uniformly elicited the warmest encomiums.

Capt. J. A. Dahlgren, of the United States Navy, the inventor of the famous cannon which bears his name, had the arm very thoroughly tested at the Washington Navy Yard, in June, 1861, and as the result of his experiments and his report thereon, the Department ordered a considerable number of the rifles for the Naval Service. In Capt. Dahlgren's minute account of his experiments with the rifle, he says :

“The mechanism is compact and strong. The piece was fired five hundred times in succession—partly divided between two mornings. There was but one failure to fire,—



supposed to be due to the absence of fulminate. *In every other instance the operation was complete.* The mechanism was not cleaned, and yet worked throughout as at first. Not the least foulness on the outside, and *very little within.* The least time of firing seven rounds was ten seconds."

Captain Alexander B. Dyer, of the United States Ordnance Corps, and at present Superintendent of the Government Armory at Springfield, made a thorough examination of the rifle at Fortress Monroe, in August, 1861. In his report of his trial, he says :

"I fired the Spencer Repeating Rifle some eighty times. The loaded piece was then laid upon the ground and covered with sand, to see what would be the effect of getting sand into the joints. No clogging or other injurious effect appeared to have been produced. The lock and lower parts of the barrel were then covered with salt water and left exposed for twenty-four hours. The rifle was then loaded and fired without difficulty. It was not cleaned during the firing, and it appeared to work quite as well at the end as at the beginning."

The exposure of the rifle to salt water for so long a time without injury, was an additional demonstration of its peculiar fitness for the Naval Service.

In November, 1861, by Special Order, No. 311, Major-General McClellan appointed Captain (now Brigadier-General) A. Pleasanton, Captain A. Sully, and Lieut. S. C. Bradford, of the Regular Service, as a Board of Examination to test the Spencer Rifle. On the 22d of November, the Board met at the United States Arsenal in Washington, and after a thorough investigation and trial of the arm, made a formal report thereon, from which the following is an extract :

"In firing it is accurate ; the range good ; the charge used smaller than is generally used in small caliber ; the cartridges, being in copper tubes, are less liable to damage. The rifle

is simple and compact in construction, and *less liable to get out of order than any other breech-loading arm now in use.*"

Col. C. L. Kingsbury, Chief of Ordnance on the Staff of Major-General McClellan, concurred substantially in the foregoing opinions, and as the result of these several examinations, trials, and tests, the War Department ordered ten thousand of the rifles for the United States Service.

Many English, French, Russian, and Swedish officers (some of whom were sent to this country by their respective Governments for the express purpose of examining the various improvements in arms and projectiles induced by the present war) have carefully examined and tested the Spencer Rifle, and have, without exception, pronounced it to be the best arm they have ever seen either in this country or in Europe.

**ARMY AND NAVY RIFLES.**—The rifles now being manufactured by the Company, for the Army and Navy of the United States, weigh without bayonet, 10 lbs.; the length of barrel 30 inches, caliber .52, weight of ball, 1 oz.

**CARBINE.**—The Company manufacture a repeating carbine of two sizes, on precisely the same principle as the rifle. The larger size weighs eight and a half pounds: the smaller, six pounds. The larger receives seven cartridges in the magazine; the smaller, nine.

**SPORTING RIFLE.**—The sporting rifle manufactured by the Company is also the same in principle as the other rifles. Its magazine receives nine charges. It is arranged with globe sights, and is adapted to the longest range. It is finished with the utmost mechanical perfection, and to sporting men, hunters, and frontiersmen, it presents a combination of advantages hitherto unattained by any arm in the world.

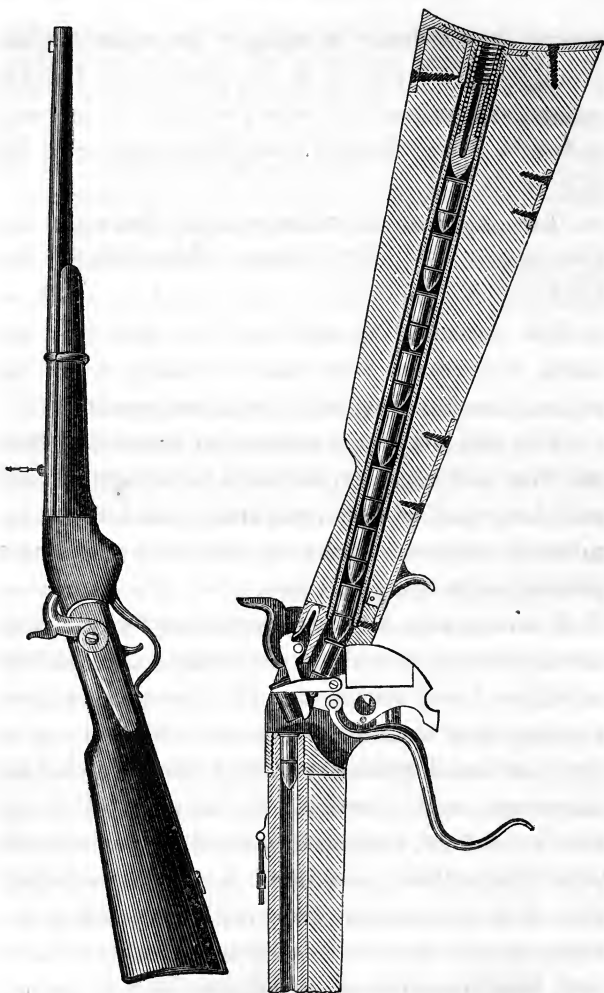
The material used, and the mechanical skill employed in the manufacture of the Spencer Rifle, Carbines, and Sporting Rifle, are the very best that can be found in the country, or

imported from abroad. No malleable iron is used for any part, and the entire mechanism will challenge a comparison with the work in any Government or private armory in this country or in Europe.

Cartridges are supplied by the Rifle Company, at the lowest practicable rates; only two sizes are used, and these are so distinct that it is impossible ever to confound them. The large size is used in the Army and Navy rifle and also in the large carbine. The small size is used in the sporting rifle and in the small carbine.

The preceding description of the Spencer rifle, which is compiled from the advertising pamphlet of the manufacturers, with the accompanying illustrations, will convey as correct an idea of its construction and capacity, as can be attained by any means short of inspection and trial; and I am ready to certify from my own tests that its performance is in all respects satisfactory.

I have elsewhere given my reasons for doubting the expediency of making use of the self-exploding cartridges for military purposes. The apprehension I expressed of danger from their accidental explosion, was based upon my own experiments, and of course was only theoretical in its application. I feel it my duty, therefore, to say that so far as I have been able to ascertain, no evil consequences have thus far ensued from this cause, and I am happy to add that from all the testimony I have been able to collect in regard to the behavior of troops armed with the Spencer rifle, and who have



Spencer Rifle.

Section of Carbine, showing cartridges in magazine, with lever down and breech open.

proved its efficiency in some of the most terrible struggles of the war, as at Gettysburg and Chickamauga, the evils which were predicted by military men as a result of rapid firing, have proved to be only imaginary.

The details of the effects of such fire upon approaching bodies of the enemy, under which "the head of the column, as it was pushed on by those behind, appeared to melt away, or sink into the earth, for though continually moving, it got no nearer," are too horrible for needless repetition.

I do not, however, consider this question of danger from accidental explosion to be yet settled, and still less, that of the comparative excellence for military purposes of the repeating or the single shooting guns using this description of ammunition. That troops who had been previously armed with muzzle-loaders, should be enthusiastic in their admiration of such a weapon as the Spencer rifle, after proving how amazingly they had gained by it, is by no means surprising, nor do I deny the obvious advantage, under certain circumstances, of being able to deliver such a torrent of fire as may be poured from these guns, when the magazine is full. But, on the other hand, there are corresponding disadvantages connected with their use, as compared with single shooters using the same kind of ammunition, which leave the question of practical supe-

riority still open, and which only experience can decide. As I have elsewhere discussed this question theoretically (page 107-8), I shall not here repeat the arguments there advanced, but will beg the reader who is interested in the question, to refer to the passage, and make his own application of them to the case in hand.

The magazine of the Spencer rifle being filled, the seven cartridges it contains may be fired in very rapid succession, the time between the discharges being only that required for throwing down and replacing the guard and cocking the lock. When the seven shots are fired, the magazine must be recharged. This is done by withdrawing from the breech a metallic tube, containing a spiral spring which pushes forward the cartridges to the barrel, dropping the cartridges into the magazine thus opened, and replacing the tube. The position for the performance of this operation is necessarily a somewhat awkward one, as the gun must be held with the muzzle pointing downward, and the cartridges inserted at the butt plate. It is obvious that this necessity renders it difficult to load while lying upon the ground, the facility for doing which constitutes one of the chief advantages of a breech loader. When the magazine is filled, the tube which had been withdrawn must be replaced, and the weapon is then ready for use.

One of the principal objects in the construction of breech-loading guns, has been to do away with the necessity of using any detached implements in performing the necessary manipulations of loading and firing. At Antietam, wherever a serious encounter had occurred, the ground was covered with ramrods, which had been lost or thrown away, and great numbers of which were afterward appropriated by visitors as mementos. I have been assured by soldiers who have seen hard service, that in time of action they never troubled themselves to return their ramrods after loading, but would stick them in the ground or throw them down until wanted again; and if suddenly forced to change their ground, of course there would be great probability that many would be left, after which the guns would be no longer serviceable.

With the Spencer rifle, the tube which must be withdrawn from the breech is liable to the same objection, that it would be an encumbrance just at those times when the value of moments can only be estimated by that of life.

With the single shooters, this periodical delay is avoided; no deviation from the regular succession of perfectly simple motions is required, the difference of time between the discharges (as compared with repeaters) is scarcely appreciable, and in continuous firing, they are equal if not superior to

the repeaters, in the number of shots delivered in a given time.

For sporting purposes, the objections I have suggested have little or no application, and the excellence of material and workmanship of the Spencer rifle, and the efficiency of its performance, will insure for it a constant and extensive demand.

I am entirely satisfied that in these respects the weapon is unexceptionable, and I desire that it may be borne in mind that the arguments adduced above, against its military use, are only theoretical, and such as occur to me in considering a question which is not yet settled, and which is literally one of *vital* importance.

Since the preceding was written, the manufacturers of the Spencer rifle have sent me the following extracts from letters just received by them, and containing valuable evidence of the merit of the gun :

*Another letter from CAPT. BARBER, of the Ohio Sharpshooters.*

HEAD-QUARTERS 1st BAT. OHIO VOL. SHARPSHOOTERS, }  
CHATTANOOGA, TENN., NOV. 8th, 1863. }

SPENCER REPEATING RIFLE COMPANY, BOSTON, MASS. :

GENTLEMEN,—

\* \* \* \* \*

I have just returned with my command from an expedition, in which we have had a good opportunity to test our rifles with the rebel sharpshooters. About six miles below



Chattanooga, the main road, over which supplies for the whole army must be drawn, lies along the banks of the Tennessee river, the south bank of which was held by the enemy, and their sharpshooters played havoc with our teams and drivers. The river is 500 yards wide. I was ordered to protect the road. The 18th Ky., armed with the Enfield rifle, had been skirmishing with them for two days, and lost three men, and had no effect on the enemy. The first day we opened on them we killed two, wounded several, and drove them from every position along the river; we found by actual trial that our guns had longer range and greater accuracy. We seldom missed at 700 yards. I had 125 men with me, and for two weeks kept 600 reb's at bay, and, as I afterward learned, killed and wounded over thirty, with a loss of one man wounded.

It was a genuine trial of arms, and resulted in proving the superiority of the Spencer Repeating Rifle over every other arm in the service.

Gen. Reynolds, Chief of Staff, said to me, "It is the best rifle on the face of the earth," and I am fully convinced that his remark is literally true.

\* \* \* \* \*

I am, very respectfully,

Your obedient servant,

G. M. BARBER,

Capt. Com'g 1st. Bat. O. V. S. S.

Col. John T. Wilder, commanding the celebrated Brigade of Mounted Infantry of the Army of the Cumberland, called sometimes the "Hatchet" and "Self-Sustaining" Brigade, well known for their gallant and constant service, writes the following letter in regard to the Rifle.

[COPY]

GREENSBURG, IND., November 28th, 1863.

AGENT SPENCER REPEATING RIFLE COMPANY, BOSTON,  
MASS.:

DEAR SIR,—Your favor, requesting my opinion concerning your Repeating Rifle came to hand, and in reply I am

happy to state, as the result of about eight months' constant practice with them, that I believe them to be the best arm for army use that I have ever seen; my Brigade of Mounted Infantry have repeatedly routed and driven largely superior forces of rebels, in some instances five or six times our number, and this result is mainly due to our being armed with the Spencer Repeating Rifle. Since using this gun we have never been driven a single rod by any kind of force or number of the enemy. At Hoover's Gap, in Tennessee, on June 24th, 1863, one of my regiments fairly defeated a rebel brigade of five regiments; they admitted a loss of over five hundred, whilst our loss was forty-seven.

My experience is that no line of men, who come within fifty yards of another force armed with the Spencer Repeating Rifles, can either get away alive, or reach them with a charge, as in either case they are certain to be destroyed by the terrible fire poured into their ranks by cool men thus armed.

My men feel as if it is impossible to be whipped, and the confidence inspired by these arms, added to their terribly destructive capacity, fully quadruples the effectiveness of my command.

If the Government would expend the large sums now used to induce men to enlist, in arming the men now in the field with this kind of weapon, the rebellion would be, in my opinion, speedily crushed by the only means that it can be destroyed by, viz.: the destruction of the rebel armies, for it is not in human nature to withstand the dreadful effects of a well directed fire from men thus armed. The gun has been put to the severest tests this past summer, and fully sustains all the claims made for it.

I believe that the ammunition used is the cheapest kind for the service, as it does not wear out in the cartridge boxes and has the quality of being water-proof—the men of my command carry 100 rounds of ammunition in their saddle bags, and in two instances went into a fight immediately after swimming their horses across streams twelve feet deep, and it is very rare that a single cartridge fails to fire.

As a sample of their value, the contrast in numbers of prisoners lost and taken by my command is a good criterion—our captures since April last number over twenty-eight hundred officers and men; our losses in prisoners for the same period number only six men.

I am, sir, very respectfully, your ob't servant,

JOHN T. WILDER,

Col. 17th Ind., Com'g 1st Brig. Mounted Infantry, Army of the Cumberland.

In another letter Col. Wilder writes, alluding to the above letter :

“My statement is rather under than above the truth—I could have mentioned a number of instances in which this gun has enabled my men to forego the hospitalities of Libby Prison. We have been cut off and surrounded a number of times, but always cut our way out.”

---

#### HENRY'S REPEATING RIFLE.

This is a new Breech-loading Rifle, the prominent feature and great advantage of which consist in the great facility and rapidity with which it can be loaded and fired. Any person can, with a few hours' practice, keep up a continuous fire of twenty shots per minute, and an expert from practice can fire it thirty times a minute, which is twice as fast as any other breech-loading gun can be loaded and fired.

In accuracy, power, and durability, it is equal to the best rifles made of corresponding weight and caliber.

The only size yet made is with a barrel 24 inches long, caliber  $\frac{44}{100}$  inch, weighing 10 lbs., and carrying a conical ball of 32 to the lb., designed especially as a sporting rifle for hunting buffalo, bears, deer, &c.

The principle of its construction is applicable to rifles, muskets, and carbines for army uses; shot guns, target

rifles, squirrel rifles, and all other varieties of sporting or military small arms.

The main feature is a magazine under the barrel, parallel with the bore of the gun, and the same length (which in the size now made holds fifteen metallic cartridges), and a lever under the lock frame, which in two motions (forward and back) cocks the gun, brings from the magazine, and places in the barrel the charge, closes the breech tight, and withdraws and ejects the empty shell; or, if the gun misses fire, withdraws the whole charge. When the magazine is filled—which can be done in thirty seconds, or less—and the gun placed to the shoulder, it can be fired fifteen times in ten seconds, without removing it.

#### TESTIMONIALS.

*Extracts from the Report of Captain (now Commander) J. A. DAHLGREN, then in command of the Washington Navy Yard:*

ORDNANCE DEPARTMENT, May 20th, 1862.

SIR:

Henry's Repeating Rifle, presented by Mr. Winchester, President of the New Haven Arms Company, has been submitted to the usual examination and test.

The principal novelty in this gun is the magazine, and the manner of loading from it. It consists of a tube, under the barrel, extending its entire length, of sufficient diameter to admit the cartridges freely. A section of this tube, near the muzzle, contains a spiral spring, to throw the cartridges upon a carrier-block in the rear. When the spring is pressed into this section, it turns upon the axis of the bore, leaving the magazine open for the introduction of cartridges, of which it holds fifteen. Upon closing it, after filling, the spring throws a cartridge upon the carrier-block, which, by a forward movement of the trigger guard, is raised to a level with the chamber, the hammer by the same movement being carried to a full cock. A reverse movement of the guard, bringing it

to its place again, forces the cartridge into the chamber, and the gun is ready to fire.

The ammunition is fixed, metal cased, with fulminate or cap in the rear. The hammer, upon falling, strikes a rod, or breech-pin, upon the front of which are two sharp points, which are driven into the rear of the cartridge, thus exploding it.

The rifle used in the experiment weighs and measures as follows :

Weight of gun complete, . . . .	9.81 lbs.
“ of barrel and magazine, . .	3.35 “
Diameter of bore, . . . . .	42 inch.
No. of grooves, . . . . .	6
“ lands, . . . . .	6
Width of groove, . . . . .	10 inch.
“ “ lands, . . . . .	10 “
Depth of grooves, . . . . .	005 “

The twist of the grooves increases from 1 turn in 120 inches to 1 turn in 33 inches at the muzzle.

Cartridges weighed as follows :

Cartridge complete, . . . . .	295 grs.
Ball, . . . . .	216 grs.
Powder, . . . . .	25 “
Tallow, . . . . .	2 “
Case, . . . . .	50 “
Fulminate, . . . . .	2 “= 295 grs.

The cartridge used for penetration, in other respects the same, contained 31 grs. powder.

The rifle was fired on the 16th and 17th inst. as follows : For time or rapidity, 187 shots were fired in 3 min. 36 sec. These were fired in rounds of 15 shots each, the actual time of firing only counted. One round (15 shots) were fired in 10.8 s. ; 120 shots were loaded and fired in 5 min. 45 sec. This includes the whole time from the first shot to the last.

One target was placed at a distance of 328 feet, and the other at 728 feet. 120 shots were fired at 328 feet; 270 shots were fired at target at 728 feet.

It is due to the inventor to say that these shots are not a fair test of accuracy, as many of them were fired by a person unaccustomed to rifle shooting. 15 shots were fired for accuracy, at a target 18 inches square, at 348 feet distance. 14 hit direct.

The firing was then continued to test endurance, &c., up to 1,040 shot, the gun not having been cleaned or repaired from the first shot. The piece was then carefully examined, and found considerably leaded and very foul, the lands and grooves not being visible. *In other respects it was found in perfect order.*

It is manifest from the above experiment that this gun may be fired with great rapidity, and is not liable to get out of order.

The penetration, in proportion to the charge used, compares favorably with that of other arms.

Very respectfully submitted,

[Signed]

W. MITCHELL,

Lieut. U. S. N.

Resp. referred to

Bureau of Ordnance,

[Signed]

J. A. DAHLGREN.

HEAD-QUARTERS, ARMY OF THE POTOMAC, }  
WASHINGTON, November 16th, 1861. }

SIR :

As I have no doubt of the merits of "Henry's Repeating Rifle," compared with other breech-loaders, I think it would be well to purchase a number, sufficient for one regiment, provided the Ordnance Department has not already ordered all that may be required for the service of this army. With the barrel lengthened, it would be an efficient arm for skirmishers, and, with carbine attachment, for cavalry. Henry's Rifle appears to be *quite equal to any in service*, in the compactness of its machinery, and the accuracy of its fire, and

*superior to others in that it may be fired 15 times without reloading, and would not ordinarily require to be loaded at all in the saddle.*

Respectfully and truly yours,

C. P. KINGSBURY,

Col. Ch'f. of Ordnance, A. P.

To Brig. Gen. MARCY.

The writers of the following letters are R. K. Williams, Judge of the Superior Court of Kentucky, and President of the Mayfield Bank, and W. W. Gardner, a Senator of the Kentucky State Legislature, both of them gentlemen of high standing, and well known not only in their own, but other States of the Union.

MAYFIELD, KY., March 3d, 1863.

O. F. WINCHESTER, Pres't :

The Henry Rifle is regarded in Kentucky as the most effective weapon known, and some most astonishing things have been accomplished with it; among these we mention one: Whilst the gallant Col. Netter was raising his regiment of Kentucky Volunteers at Owensboro, Ky., he sent fifteen of his men armed with this rifle on a scout; these men were attacked by two hundred and forty rebel soldiers in an open lane, where there was no timber for shelter, and the fifteen Union soldiers, armed with the Henry, successfully repulsed and drove from the field the two hundred and forty assailants. This unparalleled feat could not have been accomplished with any other arm known to us.

Respectfully,

R. K. WILLIAMS,

W. W. GARDNER.

The writer of the following letter, though a perfect stranger to us, we are assured is a prominent citizen of St. Louis, a lawyer and proprietor of the St. Louis Rolling Mills and Spike Works.

ST. LOUIS, Mo., June 3d, 1863.

The New Haven Arms Company :

GENTLEMEN :

I bought the first one of the Henry Rifles sold here, of my old friends, Albright & Co. I have fully tested it, having shot over 500 shots. It is *certain* death at 800 yards, and *probably* at 1,000. A regiment armed with this gun would be equal to a whole division of the army armed with the common Enfield or Springfield *stovepipe*. I have shot it at 500 yards against the Sharp rifle, and find it far superior. Yesterday I lent it to a friend, a member of the Old Guard, who was going out on a target excursion. After the shooting with the Enfield rifle, and amateur operations with Sharp's rifles, &c., my friend beat them all at a largely greater distance with your Henry. I will take the Henry rifle and shoot against any living man at 1,000 yards, with any other gun, and give him 100 yards, if his gun was made in Europe.

Yours, &amp;c.,

A. A. VANWORMER.

The following letter from Capt. Wilson, Co. M, 12th Kentucky Cavalry, is entitled to an introductory statement. The writer is an unconditional Union man, living in a strongly disloyal section of Kentucky. His neighbors had threatened his life. In consequence of this, Capt. Wilson had fitted up a log crib across the road from his front door as a sort of arsenal, where he had his Henry Rifle, Colt's Revolver, &c. One day, while at home dining with his family, seven mounted guerillas rode up, dismounted and burst into his dining room and commenced firing upon him with revolvers. The attack was so sudden that the first shot struck a glass of water his wife was raising to her lips, breaking the glass. Several other shots were fired without effect, when Capt. Wilson sprang to his feet, exclaiming, "For God's sake, gentlemen, if you wish to murder me, do not do it at my own table in presence of my family."

This caused a parley, resulting in their consent that he



might go out doors to be shot. The moment he reached his front door he sprang for his cover, and his assailants commenced firing at him. Several shots passed through his hat, and more through his clothing, but none took effect upon his person. He thus reached his cover and seized his Henry Rifle, turned upon his foes, and in five shots killed five of them; the other two sprung for their horses. As the sixth man threw his hand over the pommel of his saddle, the sixth shot took off four of his fingers; notwithstanding this he got into his saddle, but the seventh shot killed him; then starting out, Capt. Wilson killed the seventh man with the eighth shot.

In consequence of this feat the State of Kentucky armed his Company with the Henry Rifle.

This letter is in reply to one asking for an authentic statement of this remarkable feat from under his own hand, which, in the commencement of his letter, he promised to give, but which, it will be observed, he entirely omits (probably from that modesty and dislike to recounting their own deeds of daring, characteristic of truly brave men), but tacitly admits the correctness of the above statement.

MUMFORDSVILLE, KY., Feb. the 17th, 1863.

O. F. WINCHESTER, Esq., President New Haven Arms Co.

DEAR SIR :

Yours of December the 31st, came to hand on yesterday. Thanking you for the too flattering compliments paid to myself by you, I shall proceed to a candid statement of the facts as they have occurred within my own experience. In the use of the Henry gun I have had some experience in the instance of which you seem to have been apprised. When attacked *alone* by seven guerillas I found it (Henry Rifle) to be particularly useful not only in regard to its fatal precision, but also in the number of shots held in reserve for immediate action in case of an overwhelming force.

In short, I would state that, in my opinion, the Henry Rifle is decidedly the *best* gun in the service of the United States; can be used with one-half of the usual scouring and cleaning incident to the guns now principally in use, no more liable to get out of trim or unfit for service than any other gun, and will shoot with as much precision and as *terrible effect as any rifle in use anywhere*, when in good hands.

In conclusion I would say, give me sixty men armed with the Henry Repeating Rifle, with a sufficient quantity of cartridges, and it is not an overestimate to say that we are equal to a full regiment of men armed with muskets.

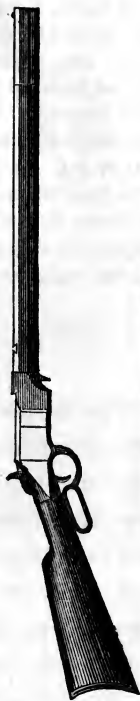
Very truly yours,

JAMES M. WILSON,  
Captain Co. M., 12th Kentucky Cavalry.

The representation of this gun will show that, notwithstanding its remarkable capacity of repetition—the magazine containing, when filled, no less than fifteen cartridges—there is nothing objectionable or unsightly in its external appearance. Indeed, in its whole getting up, it is one of the most beautiful, as in its contrivance it is certainly one of the most ingenious specimens I have ever seen of gun manufacture. It possesses some decided points of superiority over the Spencer rifle, but on the other hand it is in some respects as decidedly inferior.

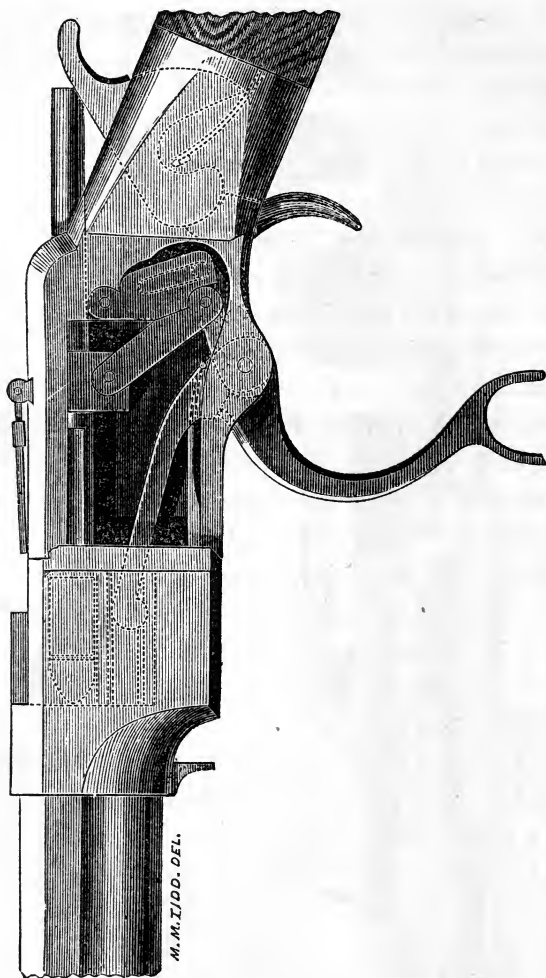
The magazine is a metal tube on the under side of the barrel, enclosing a spiral spring connected at the end nearest the muzzle with a ring or sleeve, five inches in length, which encircles and turns upon the barrel, by which movement the upper end

of the magazine is opened for the admission of the cartridges. On examining the illustration, a little projecting piece will be seen on the under side, directly in front of the shoulder at the breech of the barrel. This is the finger-piece, connected with the follower on the lower end of the spiral spring. To load the magazine, this finger-piece is drawn up to the lower end of the sleeve, which is then turned far enough to allow the follower to rest upon the edge of the magazine, where it is held in place till the cartridges are dropped in, when it is brought back, and being released, it performs its duty of pushing the cartridges down the tube to feed the barrel.

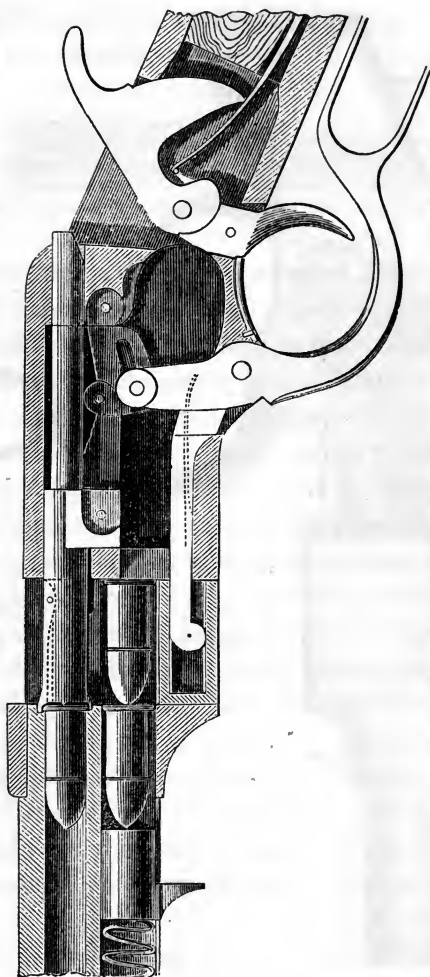


Henry's Repeating Rifle.

The second illustration represents the manner in which this operation is performed, and gives also a view of the interior mechanism, which, as may be seen, is perfectly simple and strong, being dependent only upon such limbs and joints as cannot become deranged without an actual breakage, which could hardly occur in any service to which it

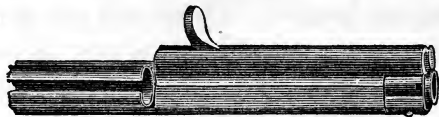


Sectional view of working parts, showing the operation of removing the empty cartridge and cocking the hammer.



Sectional view of working parts, with guard restored to place, and ready to fire.

could be exposed. By throwing down the guard, the plunger or piston is withdrawn from the breech



Muzzle of the gun, with sleeve turned aside and magazine opened to receive the cartridges.

of the barrel, bringing with it the empty cartridge which was previously fired, and throwing it out, and at the same time cocking the lock. The guard is then returned to its place, and in so doing it brings up a new cartridge from the magazine, which is pushed into the barrel by the piston, and the gun is ready to be fired. No description or even cursory examination can convey an adequate idea of the ingenuity, simplicity, and admirable operation of these movements, and it will be seen that the capacity of its magazine is such as to contain twice the number of cartridges of any other gun. This constitutes one of its points of superiority to the Spencer rifle. Another is, that the manner of loading is less objectionable, and does not involve the necessity of withdrawing any detached piece. The difficulty of loading while lying upon the ground, however, would be nearly or quite as great as with the Spencer.

A third feature, which is an obvious advantage, is the arrangement by which the hammer is thrown

back to full cock by the same movement of the guard which withdraws the cartridge, so that, on returning the guard to its place, the gun is ready to fire; whereas the Spencer requires to be cocked by hand after the guard is returned,—a momentary operation, it is true, which may be performed while bringing the gun to the shoulder; but the arrangement of Henry's rifle renders it unnecessary to remove the gun from the shoulder between fires. On the other hand, the Spencer has a decided and very important advantage over the Henry rifle in the fact that the magazine and all the mechanism by which its work is done, are enclosed in the stock, and not only out of sight, but out of the reach of injury from dust, sand, or water, and indeed are beyond reach of injury from an external blow, unless it were of sufficient violence to destroy the gun itself. The magazine of the Henry rifle consists simply of a metal tube under the barrel, which is liable to be indented by a shot or an accidental blow, and such an accident would prevent the cartridges from sliding down, and thus render the gun nearly useless, as they cannot easily be introduced into the barrel in any other way. This liability is much increased by the necessity of leaving an open slit on the under side of the magazine for the finger-piece to slide in, and thus exposing its contents to

the influence of dust and wet, which would tend to clog the passage and rust the spiral spring.

In fact, the necessity of using a spiral spring of such length, for a purpose of such importance, and where its failure would involve the loss of power to use the gun, constitutes a serious objection to both these guns, though much less objectionable in the Spencer. The movement of that portion of the mechanism also by which the cartridges are withdrawn and replaced, is entirely open on the upper side, and would be liable to become choked by the dust which is so common on the march or in action.

I have given some of the certificates of the merits of this gun, selected from a multitude which are published in the advertising pamphlet. In speaking of its accuracy, however, although several of the writers praise it highly, I find that they allude to it only in general terms, and without specifying its performance. I am bound to say that, in this particular, the shooting of the only one I have had an opportunity of testing, and which was sent to me from the manufactory for the purpose, was anything but satisfactory. I could not on an average put three shots out of five into a circle of two feet in diameter, at 100 yards, and at 200 they varied four or five feet, wandering in every direction. In the trial reported by Capt. Dahlgren, 14



out of 15 shots were placed in a target 18 inches square at 116 yards.

This is better than my experience, but certainly does not indicate such a degree of precision as most riflemen would require. I tried the gun repeatedly, and called in the aid of two experienced riflemen who succeeded no better, though one of them assured me he had seen good shooting done with it at 200 yards. To my mind the fault is sufficiently accounted for by the unequal spring of the barrel, resulting from its being suddenly reduced in thickness for the five inches nearest the muzzle, to admit the sleeve which turns upon it. It is well known that the accuracy of a thin-barrelled gun is affected by the improper adjustment of the bands, which bind it to the stock, and the accuracy of any gun is destroyed by clamping it in a vice, and it is reasonable to believe that a sudden reduction of half the thickness of the barrel, and then enclosing it in a ring revolving upon it, at the point where the greatest strain of atmospheric resistance is felt, should have a similar effect. If I am right in my conjecture, I cannot but think the evil may be remedied by some alteration of construction, which may obviate the cause, and the gun is in many respects so far superior to all others, that it is exceedingly desirable to relieve it from this objection.

For certain purposes, as for instance in such a

case as that of Captain Wilson's fight with guerillas, this want of nice accuracy is of little consequence, and the power of delivering so many shots with such rapidity is of course of inestimable value. My experience corresponds with that reported by Capt. Dahlgren in regard to its becoming leaded in the grooves. It is the only rifle I have tried which has given me any serious trouble on this score, and no amount of greasing would prevent it. When trying its accuracy, I wiped it after every shot to prevent its being affected by it.

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#### ENGLISH RIFLES.

As I do not profess, in this treatise, to give an account of the military rifles of different nations, by which I mean those made expressly for the use of their troops, I should not now allude to the weapon which has won so high a reputation in the hands of the English soldiers, were it not that it is quite time that its true history should be more generally known.

The system of manufacturing military guns by machinery, in such a manner that every part and portion of any gun,—even to the smallest screw, should be the exact counterpart and mutually interchangeable with the same piece in any other

gun of the same pattern, was an American invention, and had long been in operation in our armories, when a Committee of English officers, by permission of our Government, visited this country especially to inspect them,—and being convinced of the value and importance of the invention, they had machines constructed at Chicopee, near Springfield, and employed a number of workmen who were skilled in their use to go with them to England, and having established the manufactory at Enfield, they produced the rifle which goes by that name; a very excellent military weapon, differing but little if at all from our Springfield rifle.

#### ENFIELD RIFLE.

The superintendent and three of the foremen connected with the Enfield armory for the first four years of its existence, were Americans, who had been previously attached to the Springfield Armory. Another American has since started the works of the "London Armory Company" in that city, and is now superintending the construction of an immense armory at Birmingham, and nearly all the machinery and tools for both these establishments were made at the "Ames Manufacturing Company's" works at Chicopee.

To all this no generous mind would object, and

I have never heard it alluded to but with pleasure, as an obviously complimentary tribute to the skill of our mechanics.

But that these facts are not as widely known as they ought to be, is, I think, sufficiently evident from the statement of so intelligent a writer as Lieut. Hans Busk, who, in describing the arms of different nations, says of those of America: "The American rifles and rifled muskets admit of creditable comparison with those of European make. In external appearance they much resemble our own, which have no doubt served as models to work from." \*

We might well afford to smile at the complacency with which he gives us such an encouraging pat on the back, even if it were done in a supercilious spirit; but the treatise from which the above passage is quoted, is written in so generous and impartial a tone, and is in many places so complimentary to us, that I cannot attribute such a statement to any cause but ignorance.

The English sporting rifles are not for the most part such as would fulfil the American conception of what a rifle should be. They are too light, too thin in the barrel, and the caliber is altogether too large to be reconciled to our ideas of proper proportions.

\* *The Rifle, and how to use it.* p. 153.

## WESTLEY RICHARDS' BREECH LOADER.

To these remarks, however, the Whitworth rifle is an exception, and the breech-loading Whitworth rifle, made by Westley Richards, is constructed on such principles that I should feel no hesitation in pronouncing it a weapon of rare power, even without the assurances I have received to that effect from men in whom I have entire confidence. The bullet for this gun, though only  $\frac{44}{100}$  of an inch in diameter, is an inch and a half in length, and weighs 517 grains (nearly  $1\frac{1}{4}$  oz.), so that its weight is nearly twice as great in proportion to the surface of resistance which it presents to the air, as that of any other bullet except that of the Swiss Federal rifle, which, in its performance, is the nearest approach to the Whitworth of any rifle in actual use as a military weapon. The bullet, in fact, is a leaden bolt, and in order to enable it to maintain its proper position, with its point foremost during its flight, an exceedingly sharp twist is necessary, and the hexagonal bore is accordingly constructed with a complete turn in 20 inches, or one and a half turns in the whole length of the barrel, which is 30 inches. The weight of the charge of powder is 76 grains.

The contrivance for loading at the breech is very simple and efficient, and by the insertion of a

bolt, which is provided for the purpose, the gun may be used as a muzzle-loader.

The ammunition is contained in a paper cartridge, having, like Greene's, a greased wad of felt at its base, which remains behind after one discharge, and is driven out in front of the next, thus lubricating the bore for every bullet.

The Committee of the English Ordnance Department (from whose report I have quoted in speaking of Greene's rifle), express the opinion in regard to this gun, that, "as regards precision, it is inferior to the muzzle loader rifled on the same principle (*i. e.*, the Whitworth)—but it possesses advantages peculiar to itself, such as ease in loading, facility of manipulation (and consequent capability of great rapidity of fire), simplicity of management; is readily cleaned and examined, and is not subject to the action of the head of the ramrod, which is found to be so prejudicial to the interior of all rifled barrels."

An objection which they make to it, and which is equally applicable to its use for military or sporting purposes, is that a long and slender cartridge is necessary to contain the large charge of powder with the felt wad at its base and the long bullet in front, which in the pouch acts as a lever, rendering it extremely liable to be burst open by the necessary motion when on the march.

## PENETRATION OF DIFFERENT RIFLES.

I give below a statement of the result of experiments tried with some of the rifles I have described, to test their power of penetration. The distance was thirty yards. The target was made of inch pine boards, free from knots, and of even grain, placed an inch apart, and firmly fastened. A sufficient number of shots was fired with each gun to give satisfactory proof of its average power :

Description of Rifle.	Length of Barrel.	Weight of Powder.	Weight of Bullet.	Penetration.
Maynard, 0.5 inch caliber	20 in.	48 grs.	340 grs.	8½ in.
do. 0.35 " "	20 "	36 "	140 "	8 "
Colt, 0.44 " "	31 "	36 "	256 "	9 "
Ballard, 0.44 " "	24 "	26 "	216 "	6 "
Wesson, 0.44 " "	24 "	26 "	216 "	7 "
Henry, 0.44 " "	24 "	26 "	216 "	6 "
Spencer, 0.52 " "	30 "	38 "	450 "	9 "
Greene, 0.53 " "	36 "	88 "	575 "	13 "
Sharp, 0.52 " "	30 "	60 "	450 "	10 "
Ashcroft, 0.52 " "	30 "	60 "	450 "	11 "

In considering the above record, I must beg my readers to bear in mind what I have said elsewhere in regard to penetration as a test of power, that the record of penetrations at one time and place is not to be compared with another made under different circumstances. Any one who has ever whittled a pine stick, must know that the difference of texture in different pieces is enough to make a difference

of several inches in penetration. Thus the Spencer rifle is said by its manufacturers to have a power of penetration equal to 13 inches of pine, and I know this statement to be true, for I have seen the targets, and have had satisfactory testimony that the work was done with the Spencer rifle ; but I saw also that the wood was of much softer texture than that in which my experiments were tried, which gave only nine inches. It is therefore absurd to talk of abstract power of penetration as represented in inches, and relative power can only be ascertained by experiments conducted under circumstances as nearly equal as it is possible to have them, and I give the above as the result of such a test, as fairly conducted as it was in my power to do it. Moreover, the result even of such a test is of little value in proof of superiority of construction, unless the ratio of penetration to the size of caliber, and weight of powder and ball be also allowed for. We see by the above, for instance, that the Greene rifle has more than double the penetration of the Ballard and Henry ; but, on the other hand, the caliber of the former is very considerably larger, the barrel much longer, and the weight of powder more than three times, and the ball nearly three times that of the two last named, which are sporting rifles, while Greene's is a military rifle of the largest size. The quality of powder also is a very



important item of consideration. With the Maynard and Colt's rifle, for which I provided my own ammunition, I used the Oriental Company's F. G. sporting powder, which I always use for my own shooting. With the others I employed the cartridges furnished by the manufacturers. Finally, for the information of those who are entirely inexperienced in such matters, I would state that six inches, which is the least degree of penetration above recorded, are quite enough for any ordinary sporting service, and are more than would have been generally attained with the ordinary rifles with round bullets, which till recently have been in universal use. It has been proved that a force equal to half an inch of penetration in pine boards, is sufficient to disable a man, and these guns would maintain a greater power than that for more than half a mile.

In this connection I am tempted to speak of an error which is frequently made even by men who, if they are competent to the positions in which they are placed, must know better than their language would seem to imply. I refer to the practice of speaking of the range of a gun as if it were a distinct attribute, instead of being a power which is simply dependent upon the proportionate weights of gun, powder and lead, and the observance of certain laws of construction which are well known, and

whose effects may be easily estimated with sufficient accuracy for all practical purposes. I find, for instance, that the published certificates in regard to new guns, frequently allude to the range as being superior to that of others, without assigning any cause, or giving comparative data in proof of it. I am always reminded, by such assertions, of a remark of a countryman, who was looking through the telescope of my theodolite; on my asking him if he found it magnified the object much, "No," said he, "but it draws it right close up."

Now the range of a bullet is simply dependent upon its momentum, just as the capacity of a telescope to bring the object "close up," is the result of its magnifying power, and it is as absurd in the one case as the other to attempt a distinction. It is true that a light ball may be driven with such velocity that its momentum for a short distance may be greater than a heavier one, which would nevertheless have a longer range, because the momentum derived from velocity is sooner lost than that which results from weight. But from the expressions which are frequently made use of in conversation, and in the certificates alluded to, the idea would be conveyed that increased range was attained by some new method of construction, the object of which was entirely different, and could have no possible effect upon it. No manner of constructing

the breech of a gun, for instance, could give a greater range than is attained by the solid breech of a muzzle-loader. No such object as increased range is contemplated in constructing a breech-loader, and the most that can be hoped is to secure certain other very important advantages without any sacrifice of power in this respect.

Yet it is claimed for many of the breech-loaders, that they excel in range, when a simple comparative trial of penetration would suffice to show that no such power is developed, or if it exists, it must result from other causes than the peculiar construction by which the gun is distinguished.

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#### COMPARATIVE ACCURACY OF RIFLES.

I forbear giving a detailed statement of my experiments upon the comparative accuracy of different rifles for two reasons. In the first place, I do not feel that such a statement would be strictly impartial, because I have taken as my standard a gun to which I have long been accustomed, and to which I acknowledge a predilection; which, however desirous I might be to conduct my experiments with perfect fairness, could hardly fail to give me some advantage in its use over the performance of a gun to which I was an entire stranger. I might satisfy myself that a gun was capable of shooting

well enough for any required service, but in a comparative trial I distrust myself when I find that I always do the best shooting with the one I am familiar with.

But in addition to this I consider the details of trifling differences to possess only a limited degree of value. For instance, if a gun is reliable for a six-inch bull's eye at 100 yards, I deem it of trifling consequence whether the average distance of its shots from the central point of that bull's eye is an inch more or less ; for, except with a dead rest, not one man in a thousand but would make a greater variation than that, in firing a series of shots with the most perfect weapon that could be made. This statement will be doubted by very many persons who know nothing practically about rifle shooting, but who entertain a vague idea of the existence of a race of men somewhere "out west," who can shave off either ear of a squirrel at 100 yards without otherwise injuring him. But any experienced rifleman will call it a superior performance for off-hand shooting with open sights, to put a series of shots into a six-inch ring at that distance, and a moment's reflection will show that such work is quite nice enough for any sporting service. For it would be pretty certain death to a partridge, which I take it is as small game as any rifleman would ever spend ammunition upon, and there are very few

men who would ever shoot at such game at more than half that distance. This assertion will also be scouted by many readers, even among men accustomed to shooting, but it is true, nevertheless, as any ordinary sportsman may convince himself by taking pains to pace the distance of some of his shots at game, which (unless he has been in the habit of making such measurements) he will find is rarely so much as he thinks it is.

Of the guns I have described, I have proved to my satisfaction the accuracy of the Maynard, Colt, Ballard, Wesson, and Spencer, either of which shoots well enough for any possible demand of the sportsman.

I think the Maynard rifle will do its work with the nicest accuracy of any breech-loader I have seen, and this opinion I have formed from what I have known done by others rather than from my own experience, and I refer for proof to the targets I have given with my description of that gun.

The best shooting I have ever done myself was with Colt's rifle, with which I have placed ten successive shots at 200 yards in a space of eight by six inches, and six at 400 yards in a space of twelve by five inches. These were fired from a rest, but I have known five successive shots, fired kneeling, to be placed in an eight-inch bull's eye at 300 yards.

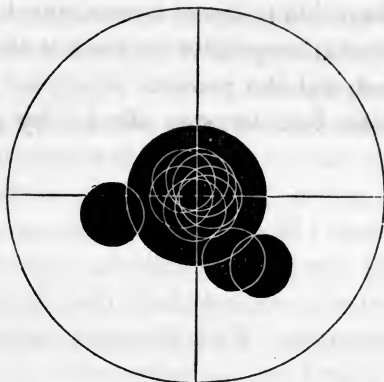
I never have been able to do anything better than this, with any muzzle-loader without the aid of a telescope and patent muzzle.

With the Spencer army rifle I have placed ten successive shots at 200 yards in a space of fourteen by nine inches. With a cavalry carbine of the same pattern I fired fifteen shots the same distance, and found nine of them within a circle of fourteen inches diameter, and none more than eighteen inches from the centre. With the same carbine at fifty yards I placed five successive shots in a two-inch ring, either of which would have killed a robin or a squirrel, and the sportsmen are not very numerous, who would shoot a greater distance at such small game.

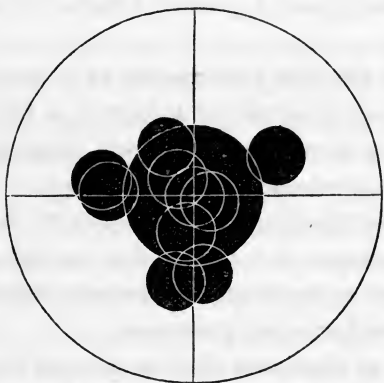
That the best performance of a breech-loading rifle, however, is inferior to that of a first rate target rifle with patent muzzle and telescope sights, I presume no one will pretend to deny.

I have given some illustrations of the accuracy of this weapon in a former chapter, and I now add two more representations of targets, selected from a great number in my possession.

One of these was shot at 55, and the other at 110 yards, with a rifle made by W. H. Baker, of Marathon, Cortland County, N. Y., and shot by Ebenezer Derby, of Cortland Village. Either of these shots would have killed a humming bird, and



Ten shots at fifty-five yards.



Ten shots at 110 yards.

it seems impossible that the art should be carried to greater perfection. But such shooting can never

be made available in actual service except from rifle pits, or some other position where a dead rest can be obtained, and the power is utterly lost from the moment the field becomes obscure by smoke or dust.



## CHAPTER VII.

### MY OWN CHOICE OF A RIFLE.

IN the preceding descriptions of guns and statements of their powers, I have endeavored to avoid everything like partiality or prejudice, and in order that I might preserve my mind unbiassed from motives of interest, I have neither asked nor accepted favors from any manufacturers beyond what was necessary to enable me to describe their arms, which I am happy to say has been freely and politely accorded to me. I have published the advertisements of manufacturers in several instances, but it will be seen that my own reports do not always coincide with their assertions, and those reports have been generally based upon experiments conducted by myself with the utmost care that I could use.

My readers will be able to form their own opinions from these reports; but apart from the mere questions of relative merit, I am well aware that an expression of individual taste will be demanded

from me, and I shall be charged with non-committalism if I do not give it. I have no hesitation in doing so, and am desirous as far as possible to give my reasons for my preference ; but I beg the reader to bear in mind that taste is a matter for which there is proverbially "no accounting," and I neither ask nor wish that any man should be governed by mine. I know many sportsmen for whose knowledge and judgment I have great respect, who differ very widely from me in their choice of a gun, and whose taste ought certainly to have as much weight as mine in the mind of any one who is seeking for information on which to build an opinion of his own. Still, as I find continually that men who seek my advice are not content with learning my opinion of the relative merits of different guns, but insist upon knowing what one I would select for my own use, I feel that I am in duty bound to make the statement. As a preliminary, however, I propose, at the risk of some repetition, to set forth the requisites which, with me, are essential, and while showing that my decision is based upon the fulfilment of these requisites, to do full justice to the points of real or fancied superiority in other weapons, which lead those who disagree with me to a different conclusion.

The service for which I have thus far had occasion to use the rifle, has been solely for shooting

large game, mostly in stalking deer. A somewhat extended experience of camp life on the prairies and in the woods, in exploring and surveying wild tracts, as well as on expeditions undertaken expressly for sporting purposes, has taught me the importance of economizing the number and weight of my equipments to the utmost possible degree. The number, because every additional article increases the danger of leaving behind or losing some implement which may be essential to the success of the expedition; and the weight, for reasons which make themselves obvious at an early stage of the march. If one goes on a mere gipsying excursion with abundant means of transportation, he may of course provide himself with whatever luxuries he may deem essential to comfort; but to my mind the zest of a life in the woods consists in securing the greatest possible liberty of locomotion, and relying, so far as may be, upon the products of the chase for subsistence. I have lived for months in the woods, carrying no other provisions than pork, hard bread, and tea, my whole kitchen furniture consisting of a knife and a tin cup, and my chief dependence being upon game roasted upon a stick, or fish wrapped in leaves and baked in a hole in the ground. Two or three men may easily carry enough of such provisions by team, or in a canoe or bateau, to last for months, and on reaching their field of operations,

may deposit them in a "home camp," and thence go out on their hunting trips, carrying a week's provisions if they wish in their knapsacks. Six crackers of common "pilot bread" are enough for a day's allowance, and five pounds of salt pork should last a week, though this of course will depend upon the game secured. In surveying, when I have had no time to look for game, I have lived for weeks together upon no other food than this, frizzling my slices of pork upon a stick held over the fire. A small piece of fresh meat may be cooked in the same way, being skewered between two slices of pork, which will salt it sufficiently and prevent its being smoked. A very small quantity of tea will last a long time, and may be made by steeping in water boiled in the tin cup. Sugar is an unnecessary luxury which no one will ever return to, who has once accustomed himself to do without it.

To correspond with the requirements of such service, the gun should be as light as is consistent with efficiency, and requiring the least possible incumbrance in the shape of ammunition and equipments. It is obvious, therefore, that the caliber of the gun becomes a matter of vital importance, since a slight addition to the weight of the ball will make a very sensible increase of the load to be carried, when one is taking a full supply. If there is a probability of meeting game which may prove

dangerous when wounded, as a bear or a moose, one would certainly feel safer if armed with a weapon which would enable him to deposit an ounce of lead in his carcase. But in order to get the full benefit of so heavy a ball, the weight of the gun must be increased proportionally, and it becomes necessary, therefore, to carry an enormous weight of gun and ammunition in order to be prepared for merely possible emergencies, while for all other service a very much less weight is all-sufficient. It is better, however, to submit to such inconvenience, disagreeable as it may be, than to run the risk of exposure to the alternative of a conflict with an enraged beast with no time to reload. But the necessity of carrying such a load may be obviated by using a repeater, carrying a ball of half the weight, for it is hardly conceivable that any animal may not be stopped by a man armed with a six-shooter. Indeed any of the single shooting metallic cartridge guns might be reloaded in time for a second or perhaps a third shot, which ought to be enough to finish the work in the hands of a man of sufficient nerve to think only of his aim. Excepting for such an occasion as this, or the more probable one of coming upon two or three deer together, or requiring a spare shot to prevent a wounded animal from escaping, there is no advantage to the sportsman from being able to load and

fire very rapidly, and he may be hunting a long time without ever meeting an adventure for which a muzzle loader would not be all sufficient. But if he ever happens to find himself in either of the above supposed positions, he will feel (if he has any of the spirit of a sportsman) that he never before had so keen a sense of the value of time; and then it is, that the few seconds more or less, required for the manipulations between the shots, become matters of vital moment. Then he will learn, if he never did before, the importance of being so familiar with those manipulations, that he goes through with them instinctively, and without taking his eye off his game; and then it is that the slightest sticking of any part or misplacement, or delay of even a single moment, becomes in his eyes a misfortune whose magnitude cannot be measured by ordinary standards.

In regard to accuracy I repeat here what I have said elsewhere, that any gun of sufficient caliber that may be relied upon to place its shots in a six-inch ring at 100 yards, that is, any gun which is found capable of doing it, when shot from a dead rest in a still time, is good enough for any service for which it will be wanted in hunting.

For shooting in the woods, and especially in pine forests like those of Maine, a barrel of 20 to 24 inches in length is much better than a longer one,

being equal to any probable demand that will be made upon it, and much more convenient to carry through the bushes, either in the hand or slung upon the back, than a longer gun. Indeed if I were getting a rifle for indiscriminate hard service, I would not choose a longer barrel than the above, though occasionally on a river, lake, or prairie, one must shoot at a very long range or not at all, and then a barrel of 31 or 32 inches in length would be preferable.

Now I am ready to acknowledge that in some respects the rifles using the self-exploding metallic cartridges fulfil the conditions required for the service I have indicated more perfectly than any other arms. Neither do I believe the danger of accidental explosion to be practically of sufficient importance to constitute an objection to their use by sportsmen, and I am well aware that they are gaining rapidly in popular estimation, as I am assured by many extensive dealers, that they now sell ten of the metallic-cartridge rifles to one of any other kind, a fact which is by no means surprising in consideration of their efficiency, and the ease and simplicity of their manipulation.

Notwithstanding these facts, however, I should select for my own use, either the Colt or Maynard rifle in preference to any other. With either of these guns in my hand, I have a confident feeling

of power, which is not inspired in an equal degree by the others. In accuracy and force they are unsurpassed, and in some particulars they possess advantages which to me are more than a balance for those which are offered in other respects by the guns which use the self-exploding cartridges. With Colt's rifle six shots may be delivered with only the interval required for cocking between them, while with most of the others, in addition to this is required the motion of throwing down the guard, and removing the empty cartridge, and then replacing the guard, and this in such emergencies as I have stated, is an important difference. The Maynard requires all this, it is true, but I have more confidence in the Maynard cartridges, which are loaded by the gunner himself with such powder as he chooses, than in those which are bought ready made, and can only be proved on trial. It has happened in the course of my trials of guns using the self-exploding cartridges, that I have once found a whole box of them too large for the caliber of the gun they professed to be made for, and twice they have proved deficient in strength, and on my making this latter fault known to the manufacturers of the guns (who had themselves furnished the ammunition for me to prove them), they discovered on investigation that an inferior quality of powder had been made use of in filling them, and of course



without their knowledge. This would be much more likely to happen to an indiscriminate purchaser, and is precisely one of the kind of annoyances, compared with which any amount of trouble, which enables one to prevent the possibility of its occurrence, is to my mind of trifling consequence. The cost of the self-exploding cartridges is nearly double that of loose ammunition, and if much shooting is to be done, this constitutes an important item for consideration.

The equipments required with Colt's rifle are a powder flask with proper sized charger (which may be had of the manufacturers, of a shape peculiarly adapted to convenience in loading), and a pouch for bullets and caps. In addition to these I always carry a turnscrew in my pocket. Rags and oil for cleaning, as well as spare ammunition, may be carried in the knapsack. I am well aware that this simple list might be very largely increased by the addition of articles which might sometimes prove convenient, but this is all that is absolutely necessary, and I never carry anything more. A gun case fitted up with implements for every imaginable emergency, each in its nest of velvet, has no longer for me the attractive charms which in my less experienced days would have rendered it irresistible. I acknowledge, however, that I do not meet with

many *gentlemen* sportsmen of such primitive simplicity of taste as myself.

With the Maynard rifle, in addition to the above equipments, a supply of cartridge cases and the implement for loading them are necessary, but only the loaded cartridges need be carried about the person, as a supply for a week's hunting can be prepared in a very few minutes. The Maynard is lighter and can be packed in less space than the Colt, and certainly is unsurpassed for precision and power.

Of the guns which use the self-exploding cartridges, I should choose the Wesson for my own use in preference to any which are yet in the market. To my fancy the advantages of the repeating guns of this description are not of sufficient importance to counterbalance the objections which may be urged against them. The Wesson may be reloaded quick enough for any probable demand, and its compact and graceful form and thorough finish, combined with its great force and accuracy, render it an admirable weapon for the sportsman who desires a gun of that description.

The guns which require a paper or cloth cartridge are still less to my taste than those which use the self-exploding ammunition. They are not so reliable for nice shooting, and the cartridges are inconvenient to carry and liable to become injured.

Perhaps a reason for my distaste of cartridges of any kind, may be found in the sense of dependence incurred by their use, which confines one always to the same degree of power and renders the gun useless when the special ammunition is exhausted.

It will be seen that my selection is made solely with reference to sporting service. My ideas with regard to guns for military use may be gathered from preceding pages. From the great variety of opinions I have heard expressed by different officers, I am satisfied that a great deal yet remains to be decided in regard to the most efficient weapon for field service. In precision and range the Springfield rifle seems to answer every possible demand, but theoretically it seems incredible that it should not ere long be superseded by some of the breech-loading arms, which are quite equal to it in those respects, and so far superior in facility of manipulation. In the Prussian service the breech-loading "needle gun" has been introduced throughout the army, for all classes of troops, and its value is considered to have been sufficiently and satisfactorily proved. Yet it is far inferior in simplicity and in no respect superior in performance to several which I have described. It is fired by means of a steel needle in the breech, which is forced through the cartridge, and driven by means of a spring against the fulminate, which is in the base of the bullet.

A great variety of breech-loaders, some of which I have not even named, are now in process of trial in our army, and their merits and defects will soon be ascertained by the test of experience. Unless the same troops, however, are allowed to use different arms in succession, a difficulty in deciding may arise, from the fact that each regiment, having only the old muzzle-loaders as a standard of comparison, will be ready to declare in favor of whatever breech-loader may have been placed in their hands. Of this we have already had curious evidence, in the enthusiasm expressed in favor of different arms by the soldiers to whom they have been given, and who, finding them so far superior to the old muzzle-loaders are very ready to pronounce them the best that can be produced. An officer who, by my advice, took with him into the field a Colt's rifle, told me after a year's service that he had seen nothing superior to it, and that nothing would induce him to part with it if he were unable to replace it. Another officer, after a similar experience with the Spencer rifle, made an equally favorable report of that weapon; but neither of them was ready to express himself in favor of the general introduction of such arms for the use of troops.

For amateurs who value the rifle solely for its capacity to win matches, which are decided by differences of fractions of an inch in a string of shots,

the ponderous telescope rifle will of course hold undisputed preference, for nothing else can compete with it. Such shooting with such guns has for me no interest, except as a matter of curiosity, in developing the degree of perfection it is possible to attain in the construction of the weapon. In practice the guns are laid upon a solid frame of timber, and elevated or depressed with a screw, like artillery. Streamers of light cotton cloth attached to poles are fixed at intervals along the line of fire to indicate the direction and force of the wind. The aim being adjusted, the shooter has nothing to do but watch the flags, and decide upon the right moment to pull the trigger, which he may do himself or direct another to do for him, with equal certainty of success.

A great deal may be learned in this way of the principles of rifle shooting which could not be certainly proved by any other means. The gun being fixed and the aim being mathematically exact, the effect of wind, of different qualities and quantities of powder, weight of ball, etc., may be arrived at with a degree of certainty which is unattainable in the ordinary mode of shooting, and which constitute in themselves an important and interesting study. But it is obvious that little or nothing is to be acquired by such practice which tends to give men the power to make a rapid and effective use of

the rifle in the field. This is only to be attained by off-hand target practice, which is a noble and exhilarating sport, indicating to the nicest degree the personal skill of the shooter, and is the only kind, except the pursuit of game, which is worthy of general encouragement.

If the reader who proposes to provide himself with a rifle has any definite idea of the use he intends to make of it, I trust he may be able from the list I have given, and with the previous hints on general principles, to make such a selection as will meet his wants. It will be seen, however, that my list of guns is rather intended for the use of those who are not confined in their choice by military rules, but desire only to select an efficient weapon, and find themselves at a loss among the multitude of new inventions which are offered them.

Many men have no other feeling on the subject than the patriotic desire to attain such familiarity with the weapon as would render them efficient as soldiers, a spirit worthy of all honor, and the good results of which have been made manifest by the services rendered to the country by the Mass. Rifle Club, to which (or to similar associations in their own vicinity) I would urge all to attach themselves who desire to attain a military knowledge of the rifle and its use, according to the most thorough

and approved system, which is that adopted at the "Hythe School of Musketry."

Two instructors are employed by the Mass. Rifle Club, the one teaching Infantry tactics, and the other the Hythe system of rifle shooting.

Captain Moore, who has charge of the first-named branch, has served in the U. S. Army, and Mr. Pease, the rifle instructor, has been drilled at Hythe, and served in the British Army. It is optional with members of the club to learn either or both branches.

The peculiarity of the Hythe system is, that most of the instruction is given before the learner is allowed to fire at all. The knowledge of the rifle and all its parts, the theory of projectiles, estimating distances, loading, aiming while standing and while kneeling (no firing from a rest is allowed), all these are taught before the squads are taken to the shooting ground.

The first practice in shooting is at 100 yards, and the pupil is often surprised at his own proficiency. By a regular advance the distance is increased to 900 yards; and the patient learner is certain in a few weeks to become a good shot even at that range.

The details of the system are given in Lieut. Hans Busk's "Hand-book for Hythe," and also (and I think in a more simple and practical form)

in the "Manual of Target Practice for the U. S. Army," by Major G. L. Willard.

An instructor, however, is necessary for the attainment of the full benefit of such a system of training, and few men would have the patience to go through it voluntarily, without the stimulus of class companionship.

I have been furnished with an interesting series of targets shot at different ranges by pupils who had had no knowledge of the use of the rifle previous to their connection with the Mass. Rifle Club, but the following summary will probably prove more interesting to general readers than a detailed statement of progressive attainment.

"The journal recently gave the following as specimens of the shooting done by the Rifle Class. We have seen a target 6 feet by 4, with a 2-foot bull's eye, at which a class at 500 yards distant fired a single volley of 12 shots; 10 of the 12 shots were on the target, none more than 18 inches from the bull's eye.

"We have another specimen of individual shooting—target 6 feet square, 2-foot bull's eye; five shots were fired successively at 800, and 5 at 900 yards (*more than half a mile*). Six of the 10 shots were on the target, one from 900 yards, near the centre of the bull's eye; 4 would have killed or wounded a single man standing over the centre of the target;



the remaining 2 shots would have killed or wounded both the men standing in line of battle on either side. This shooting was done with a common Enfield Rifle at the practice ground of the Mass. Rifle Club, at Wollaston, in the presence of a number of gentlemen of Boston, by a member of the club who never fired a rifle till this season."

A very large class of amateurs, however, are men who have no fancy for military training, and who find a pleasure in solitary practice, or the pursuit of game. And the taste for such use of the rifle is no less to be encouraged than the other, since nothing tends so directly to give vital and effective power to the physical strength of a nation, as a general familiarity with the use of so powerful a weapon.

Such amateurs will indulge their own fancy in the selection of a weapon, and will be governed in their decision by its real or imaginary adaptation to their peculiar wants and means. Apart from the question of efficiency, most men will be more or less influenced by that of symmetry. Extraneous ornament is to my eye offensive. I want only thorough finish, and that in the most compact and symmetrical form. The turn of the stock, the fittings of the parts, the action of the lock, the balance at a trail or in aiming, are all points of importance to my taste. I find a pleasure in using, or even in

looking at a weapon which conforms to my taste in these particulars, which is at once disturbed by their deficiency, or by the presence of any unseemly addition, which mars the general sense of proportion or interferes in any way with its efficiency of action or ease of manipulation.

Whatever gun is selected, however, there is one injunction I would impress upon its owner as absolutely essential to its continued good performance, and that is that it be kept scrupulously clean. It is urged in favor of many of the breech-loaders, that they clean themselves at every shot, and there is no doubt that some of them do so, at least to a greater degree than a muzzle-loader. But it is certain that every bullet must sweep out the residuum of the previous charge, and I know that the accuracy of its flight may be thus seriously affected, and in target shooting, I find a perceptible advantage from wiping my barrel after every shot. At all events no rifle should ever be put away for a single night without being carefully swabbed with wet, dry, and oiled rags. The nipples should always be cleaned after use, and frequently removed and oiled; the machinery of the lock should always be kept in perfect order, and whenever the gun is laid aside it should be rubbed, stock, lock, and barrel, first with an oiled and then with a dry rag. In regard to the kind of oil I am not such a quiddle as some sports-

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men whom I have known. I use the best sperm oil I can get, but am only careful *not* to use vegetable oils, which are liable to get gummy.

In regard to powder I advise beginners to experiment with different kinds, and observe their different effects, and they will thus learn more, and remember it better, than they can possibly do from written directions. Try target shooting at any distance you are used to, and having ascertained the proper arrangement of your sights for one kind of powder, try another, with the sights at the same elevation, and see how it compares with the first in a series of shots. You will find it necessary to give more elevation for one kind and less for another, as it is stronger or weaker, and having satisfied yourself which is best for your purpose, do not afterwards change, but shoot always with the same powder, and if you would economize, buy it of the manufacturers by the 6 lb. keg, instead of getting half a pound at a time in a fancy canister at the sporting shops.

Lieutenant Busk gives directions for casting bullets, in "The Rifle, and how to use it," which comprise all that is needful, except that he makes no mention of the necessity of having the mould well heated before it will turn out good smooth bullets. It will become hot enough very soon by the mere act of use, but I always cast half a dozen or so

before beginning to save them. I then find the lead remains soft in the mould long enough to settle it by one or two gentle knocks on the bottom of the mould, and the bullet then comes out perfectly smooth. Before beginning I wipe out the mould with a very slightly oiled rag, or smoke the mould with a lamp, and the bullets will then drop out of their own weight, whereas they are otherwise apt to stick. For a breech-loading gun I find no advantage in swedged bullets over those which are thus carefully cast. For nice shooting, however, they should be weighed and carefully assorted, and those of the same weights used together. With the utmost care in casting, bullets of half an ounce weight will be found to vary two or three, and occasionally even four grains in weight, and in shooting 200 yards, the heaviest bullets will average an inch or two above the light ones, owing to their greater momentum and consequent power of overcoming atmospheric resistance.

#### AIMING POSITION.

I have refrained from giving directions for position, manner of holding the gun, etc., because I never have been able myself to derive any aid from such directions, and I have desired to avoid repetitions of such items as may be found in other works on the subject.

In order, however, to convey my idea better than I could possibly do by any description, of a firm and graceful position in aiming, as contrasted with an awkward and constrained one, I give the annexed illustrations, in which are shown in juxtaposition two figures which I think no one can compare without recognizing the difference I allude to. Yet those figures are copied from different treatises on the rifle, and were in each case intended as guides to learners, and probably not one man in a thousand, looking at either by itself, would notice the ease and strength of the one, or the ungainliness of the other, which are so apparent by comparison. The first is from Chapman's book on "The Improved American Rifle," and is a perfect representation (from a daguerreotype) of the customary aiming position with our best riflemen. The other is from Lieutenant Hans Busk's "Hand-book for Hythe," where it is given as the aiming position in his illustration of "position drill." I do not think that anything I could say would add to the value of what may be learned by a careful comparative study of the two. An English writer especially cautions learners against the "American custom of holding the heel-plate against the biceps muscle, instead of directly on the shoulder," and for the light English rifles shooting an ounce ball the caution is no doubt necessary on account of the recoil,

but with guns of proper weight, caliber, and balance, it is needless, and the difference of effect may



be seen in these figures. It is wrong, however, to say that we hold the heel-plate against the biceps muscle. It rests rather in the hollow, between that muscle and the shoulder, and the shooter is thus enabled to elevate the breech of his gun sufficiently to avoid twisting his neck in the awkward manner represented in the English illustration.

I have read a great many directions by different writers for insuring an accurate aim, but never one which to me was satisfactory, and I do not believe

it is possible to describe the process, mental and physical, by which the object is attained. Much



stress is usually laid upon the necessity of a perfectly steady hand. Now I do not believe it is possible for any man while his heart beats to prevent a degree of motion in the muzzle of his gun, sufficient, if not calculated upon and allowed for, to have a perceptible effect upon his shot. I always involuntarily hold my breath when aiming, which helps matters considerably, but I never yet succeeded in holding my sights immovably fixed upon the object long enough to pull the trigger. The art consists,

therefore, in beginning the pressure, just at that instant of approach, which shall insure the explosion at the precise moment when the sights are alligned on the object, and this can only be attained by practice.

Frank Forester sums up my own ideas on the subject in these few words. "To teach how this is to be done is impossible, beyond saying that it is to be done. Practice and coolness can alone effect the ability to do it, even with those constituted by temper, physical and moral, to attain the power."

My desire has been rather to give such hints as may incite others to seek and find out for themselves, than to furnish a manual of instructions, enough of which are already extant, and I am sure they will find a source of unfailing interest in the prosecution of both practical and theoretical investigations.

Yet I am unwilling to close without a word of warning on one point which cannot be too often repeated, and yet concerning which a great deal of unnecessary, because misdirected caution is constantly exercised. I allude, of course, to the danger of accidents. I am often asked by parents my opinion of the expediency of trusting their boys with firearms. Every man who has a son is interested in the question, for the day will surely come that his boy will be begging for a gun, and if he is



predetermined to forbid it, he has need to have his answer ready, and in such form as may be decisive, for it is hardly probable that the child will encounter, between the ages of fourteen and eighteen, any stronger temptation to disobedience. I need hardly say that I should by no means acquiesce in the wisdom of such a decision, for as a general rule, I think *every* boy should be taught to shoot, and yet I am sure that no man can have a greater apprehension of the danger of an ignorant and careless use of firearms than I have, and in fact it is my consciousness that the danger is always the result of one of these faults, which constitutes the strongest argument in my mind in favor of having every boy properly instructed in their use.

If, however, the boy is clumsy and awkward in his ordinary manipulations of tools and toys, or if he is habitually foolhardy, careless, or forgetful, I would not trust him without severe training, and constant watchfulness, till he had acquired a different habit, and I grant that in some cases it is next to an impossibility to overcome the faults or deficiencies of such a nature. But if he is reasonably careful and sagacious, and naturally *handy*, I should feel no hesitation in putting a gun in his hands and allowing him to use it, after careful instruction in its principles, and being satisfied that he not only understood, but habitually attended to

them. The trouble in most cases is, that the father is unable, or has not the time himself to give the necessary instruction, and the boy is suffered to take a gun and learn how to use it as he best may, and this fact is sufficient to account for the multitude of accidents which occur. It is as easy to use a gun with safety as a penknife, but the momentary carelessness, which in the one case results in a cut finger, may in the other be a matter of life and death, and the foolhardy neglect of the plainest dictates of common sense in the use of firearms is so prevalent, that the wonder is that accidents are so rare rather than so frequent. I have known parents, who could not overcome their dread of firearms, to make a compromise between their own fears and their boy's entreaties, and suffer him to take a pistol, with which the chances of his injuring himself or another are ten times greater than with a gun of his own length. Not one boy in fifty that one meets in the fields with a gun in his hands, has ever been taught that the hammer should never rest upon the cap in carrying, and they may be constantly seen with their guns at a trail or on the shoulder with the muzzle pointed directly at a companion, who seems equally ignorant or heedless of the possibility of an accidental discharge. Not a summer passes that we do not hear of men or boys being killed by drawing a gun by the muzzle out

of a boat or over a fence, or shooting somebody else by snapping a gun at him in sport, not knowing it was loaded. It is a mistaken sympathy, in such cases as the last named, which would shield the perpetrator from further penalty than the remorse which comes too late. The dread of such remorse does not prevent the recurrence of the act, and it is high time a more efficient safeguard were applied. If the plea were urged in extenuation that there was no malice in the act, my reply would be that society must protect itself so far as may be from fools as well as knaves.

Captain Marcy says in his "Hand-book for Overland Expeditions:" "I have always observed that those persons who are most familiar with fire-arms are invariably the most careful in their use. That finished sportsman and wonderful shot, Captain Martin Scott, than whom a more gallant soldier never fought a battle, was the most careful man with firearms I ever knew, and up to the time that he received his death wound on the bloody field of Molino del Rey, he never ceased his cautionary advice to young officers on this subject. His extended experience and intimate acquaintance with the use of arms, had fully impressed him with its importance, and no man ever lived whose opinions on this subject should carry greater weight."

In my opinion, instruction in the use of firearms should be a part of the regular system in our public schools. It is already practised to some extent in Boston and vicinity, and it is to be hoped it may soon become universal. Meantime there is one rule which every father may impress upon his boy on giving him a gun, and even if he is incapable of giving him any further instruction, it may be the means of saving his life or that of a companion ; and that is, to observe at all times, whether his gun is loaded or empty, that it is never for a single instant pointed at himself or any one else. By constantly impressing this rule upon him its practice will soon become involuntary, and will prevent any evil results if an accidental discharge takes place.

But in rifle practice this is not sufficient. A rifle bullet is easily fatal at a mile's distance, and no man should ever send one out of his barrel without considering the possibilities of its range. Yet many men who know this fact are constantly regardless of it, shooting not only at targets without regard to the course of their bullets beyond, but at any bird in a tree which offers a fair shot, though the elevation required must necessarily send the bullet to such a distance that it is impossible for them to know what may be in the range. It is true, the chances are that no mischief will ensue,

and most men seem to be willing to trust to chance rather than common sense, perhaps owing to the fact that they have not enough of the latter commodity to make a perceptible difference of effect. But this is precisely the kind of carelessness from which occasionally an accident results, which is sounded as a warning through the newspapers, while nobody hears of the thousand narrow escapes which indicate the frequency of such carelessness. I was surveying not long since in a field within ten miles of Boston, when a bullet cut the sod within a foot of where I was standing, shot from such a distance, that I had no time to go in search of the worthy to whom I was indebted for the attention, and who very probably would have favored me with a piece of valuable advice on the subject of being "scared before I was hurt."

The danger from ricochets, or glancing shot is one also of which no one can have a realizing appreciation who has not witnessed their eccentricities. I have known bullets which the shooter supposed to be safely lodged in the hillside against which he had placed his target, to glance out at a widely divergent angle from his line of fire, and be heard cutting through tree tops a quarter of a mile off. In fact, unless shot into an embankment which is very nearly perpendicular, they will rarely fail to glance out, and their further course is one which

cannot possibly be foretold. Neither is this danger confined to the case where the bullet strikes upon hard or stony ground. They will ricochet from soft peat meadow, even when shot downward at a very considerable angle, and I have known a bullet shot into a stream from a high bank to rebound and lodge in a tree at least fifty feet above its surface on the other side.

The greatly increased number of persons who are now engaged in rifle practice, renders it more than ever important that these facts should be constantly impressed upon their minds, and it is my own conviction of the general want of a distinct comprehension and appreciation of the danger and the means of guarding against it, which induces me to dwell with so much earnestness upon its details.

I should be glad to believe that the necessity for a general knowledge of the use of arms, was no greater than it has been during the period of our national existence which we had fondly dreamed was destined to continue as our normal condition. But those days are past, and I find no thoughtful person, whatever may be his hopes or fears for the future, who anticipates a speedy return to peace and security, or imagines that the storm which has been so long raging will subside without tumultuous demonstrations, and scenes of violence re-

quiring prompt and energetic action to prevent their becoming revolutionary. Even if we are fortunate enough to escape such dangers, no one will deny the probability that scenes of individual crime and violence are likely to be increased, by the presence in every community of men whose military experience has served only to familiarize them with scenes of horror, while it has unfitted them for the peaceful occupations of honest industry. Apart from those who have entered the army from noble and patriotic motives, every regiment, as a matter of necessity, contains more or less men of the class who wanted only the experience of familiarity with bloodshed to complete their education as desperadoes, and the probability that such vermin will infest every community, and become the leaders, or the willing instruments of others, in acts of crime whose magnitude and desperation will only be limited by the probabilities of success, constitutes a sufficient motive for making such preparations as may render the undertaking too hazardous to be ventured upon. The best possible safeguard against dangers of this nature, consists in such universal practical familiarity with the use of arms that every community may be able to protect itself individually or collectively from attack. Military organization will, of course, become a measure of national neces-

sity with us for the future, and I shall be glad if I can feel that I have aided in promoting its efficiency, by exciting the desire, or pointing out the means, of attaining to individual excellence in the use of arms.



## AN ESSAY ON RIFLES.

BY EDWARD STABLER, OF HAREWOOD, MD.

THE following interesting essay has been very kindly furnished me by Mr. Edward Stabler, of Harewood, Maryland, in reply to a circular letter of mine soliciting information derived from his own experience.

That he is a veteran and zealous sportsman and a keen and shrewd observer, will be evident on perusal of the article, and for the information of readers at a distance from the section of country in which he resides, I may state that his character for sterling integrity is sufficient to put the stamp of truth upon his statements, in the minds of all who know him.

The figure in the frontispiece of this volume is a photograph portrait of Mr. Stabler, and the background represents accurately a scene on Cheat river, in Virginia, which is one of his favorite hunting grounds.

HAREWOOD, MD., *March 20, 1863.*

TO H. W. S. CLEVELAND, Esq., Danvers, Mass. :

Through the kindness of a friend, to whom I feel under many obligations, I am in receipt of a circular, requesting the results of my experience in the use of the rifle. Without any desire to obtain notoriety on this, or indeed on any other subject, I am willing to respond to some of the queries embraced therein ; and if, on perusal, my remarks are considered of any value to others, I perceive no objection to their profiting by them.

I have been familiar with the use of rifles of various kinds for sporting purposes—and in that line only, do I speak of them—for more than fifty years. That the rifle may be used without detriment to civilization and social comfort, but often to their advancement, is just as true as that it is too often the means used to destroy and lay waste everything that renders life desirable.

Although always fond of field-sports, the precarious state of my health for many years compelled me to seek relaxation in the open air from the engraving stand and machine shop. A country life afforded the opportunity to gratify my inclination ; and at the same time the inducement to take such exercise as my health absolutely required, and which alone enabled me successfully to follow a sedentary if not unhealthy employment. I have

no doubt, whatever, that my life has been prolonged for years and comparative robust health attained by this form of exercise ; generally on foot, often walking twelve to fifteen miles a day ; and when my business engagements would permit, inhaling the pure mountain air.

In my experience in early life, and dearly bought too, while subject to attacks of hæmorrhage of the lungs, the use of the *rifle* was found to be a much better remedy than the *lancet*, then almost universally used in a threatened pulmonary disease.

Of course at that early day I, like all others, used the old-fashioned flint-lock and long muzzle-loading rifles ; for no one then thought of *percussion* locks, *waterproof* caps, *patent* cones, &c., much less of a breech-loading and self-priming rifle which could be fired 15 to 20 times a minute and prove effective at eight hundred to one thousand yards distance. Such, however, is certainly the case at this day ; and but for these great inventions and improvements, which enable me at this time, though nearly “three score and ten,” to use my rifle almost as effectively as I could fifty years ago, my hunting career would have long since ended ; if from no other cause, from failure of eye-sight. The queries are, first,

“What is the relative value of even, or gain

twists, and what degree of twist do you find to insure the greatest accuracy?"

I have never used to much extent a rifle with *gain* twist; my own judgment was against the *improvement*, as more likely in using round balls which require patching to strip in the grooves; this, however, may not so affect an elongated or conical ball fired from a breech-loading rifle, where the ball itself receives the full impress of the grooving in the barrel at the time of firing; yet, still, this greater liability to strip exists in the initial velocity if we increase the rotary motion of the ball. The same effect is also produced, to some extent at least, by *too quick*, though "even," a twist in the grooving. What is required in rifle practice to insure accuracy, and it is necessary, is that the projectile, whether round or conical, should revolve on its own axis; more than this impairs the momentum by increasing the resistance of the atmosphere.

In accidentally witnessing some target practice not long since with a rifled cannon grooved one turn in its length, fired over the water, and where, standing in the rear of the gun, I could distinctly see the course of the ball, there was no precision in the firing. The balls were stripped, partially at least, in many, if not in a majority, of the shots; the lead torn off and flying at a tangent, while the ball apparently, instead of revolving on its own axis and in

a direct line, performed the gyrations of a *cork screw*.

Such nearly, in result, a friend informed me was the case with his target practice, using a breech-loading rifle of some celebrity, with gain twist; he consulted me as to the cause of this variation—remarking that his rifle was much more reliable at some ranges than at others. I could account for it in no other way than at least a partial stripping of the ball, for the rifle was, in workmanship, well made throughout—though defective, as I thought, in principle, in several particulars.

These views may possibly be considered somewhat theoretical; but practically I have found no advantage of the “gain” over the “even” twist; and my experience and observation so far, is against the former. My engagements have not permitted experiments to solve the problem authoritatively; when, at the same time, it was not considered of material consequence in my hunting, for I could do as good shooting at least, with the “even” or regular twist, as any one with me did with a “gain” twist rifle. One revolution in four or five feet, according to caliber, and regular twist, is what I use. In the rifled cannon alluded to, and to correspond *in principle* with the sporting rifle, the twist should have one revolution in about *thirty-five feet*; when, in fact, there was one turn in five feet, and

the caliber of the gun seven times greater diameter, with increased initial velocity also ; but doubtless it was *twisted* on the principle of "try all things," &c.

"What should be the proportionate length of the barrel to the caliber, to insure the greatest accuracy? What length of barrel is necessary to insure the greatest penetration? and in what ratio is the penetration diminished by increasing the barrel beyond that point?"

In my early hunting days, as before remarked, I used, of necessity, the long heavy rifle. The old rifle, to be effective, was held necessarily to be from three and a half, to four feet in length of barrel, and from nine to twelve pounds in weight. Such a gun my strength did not enable me to hunt with ; and I began by first reducing the weight, and then the length, carrying both to extremes, as was then thought by some. I reduced the weight from ten or twelve pounds, and carrying a round ball of sixty to eighty to the pound, to a rifle weighing five to six pounds, and some forty inches long, but carrying a ball of *three hundred* to the pound. The latter did very well for small game, (and I frequently killed beeves with it,) but the ball was too easily and certainly affected by the wind, and the rifle required cleaning too frequently.

Being satisfied from all my experiments that a round ball of about one hundred to the pound suited

well for both small and large game, *if hit in the right place*—and I experimented with all sizes, from sixteen to the pound upwards—that size was adopted, and the length gradually reduced, to ascertain how short a rifle could be left, to be effective in aim and most convenient in handling, carefully noting the shooting, as I progressed, both with the rifle and shot gun.

The result of all these experiments then satisfied me fully, and subsequent experience has abundantly confirmed them, that the old heavy and long rifle was wholly unnecessary for hunting purposes. Without aiming at mathematical precision in results, the conclusion was arrived at, that a rifle barrel of eighteen to twenty-two inches in length gave the greatest penetration, all else being equal, and a gauge of  $\frac{6}{16}$  inches ; *i.e.*, the size of a round patched ball of about ninety to the pound, or forty-five elongated or conical balls.

This, however, was ascertained to be at the expense of the general accuracy of the rifle. I found that from twenty-eight to thirty-three inches in length, with  $\frac{6}{16}$ -inch gauge, the penetration was sufficient for all practical purposes, while the accuracy—and more especially with a *rear-sighted gun*—was fully preserved, and the rifle sufficiently portable and convenient in handling. That length, say about thirty-two inches, is decidedly preferred, both

for my shot and rifle barrels, except at long range and for wild fowl; when I would add six or eight inches to the shot barrel, in a 5, 6, or 7-gauge gun; *i.e.*, 1 inch,  $\frac{1}{16}$ , or  $\frac{7}{8}$  caliber. But as much or more depends upon the proper *charge* in shot guns, than length of barrels.

The difference in penetration in my "Maynard" rifle, with the 20-inch and 32-inch barrel, small caliber, both  $\frac{6}{16}$  gauge, is about 5 per cent. in favor of the short barrel. With the 20-inch barrel in another experiment, and using *forty grains of powder*, with a conical ball of 46 to the pound, the penetration was eleven inches, *through* two seasoned and sound hemlock scantling, one five and the other six inches thick, placed three feet apart; but beyond this there was no obstruction to the ball. The projectile used was a conical lead ball. In *hard oak*, the penetration would be much less.

A much greater penetration, however, and greatly more effective projectile is readily obtained, and with very little additional trouble and no expense in material in moulding the balls, by a pointed centre-piece of very hard composition, forming a compound as hard as brass, and is also as conveniently moulded as the soft leaden ball; the shoulder near the point being of rather less diameter than the full size after the lead is cast round it, and just sufficient to escape the grooves.



The point, of this shape, showing a section of the projectile, and precisely the same cone as the finished ball, is dropped into the mould before casting the lead, and readily retains its position there. To prevent the possibility of separation of the two metals, they may be amalgamated or soldered together by a very simple process, without any additional trouble. After many experiments to determine the best kind of metal, or alloys of different metals, for the points,—from tin to hardened cast steel, I find zinc to be the most economical, and quite efficient; as it does not batter in the least when fired into the hardest seasoned wood.



The advantage to the sportsman and hunter, must be most obvious; for, if the hard-pointed ball strikes a small limb or bush, it will not batter and glance off, *but goes through* and keeps its course, or nearly so; and even a *bone* will scarcely turn and will not stop it.

By actual and repeated experiments I find the difference in penetration between the hard-pointed and leaden ball, fired into very hard seasoned white oak, more than double, and with precisely the same charge of powder. And comparing it with the Enfield rifle and its usual cartridge of 60 grains of powder and ounce lead ball, the difference is almost

three to one in favor of my small-caliber Maynard and hard-pointed ball, and with only *half* the charge of powder. It also readily penetrates wrought or cast iron where the leaden ball makes no impression whatever.

“What form of projectile does your experience prove to be the most reliable for accurate shooting? and what do you find to be the best proportionate weight of powder and lead?”

With muzzle-loading rifles, I prefer the round ball; as I have found it very difficult if not impracticable to load a conical ball properly with the rod, so as to shoot with accuracy and uniformity, at any range.\* But with a well-constructed breech-loading rifle, and using an accurately fitting metal cartridge, I as decidedly prefer the conical ball.

My usual charge of powder for a  $\frac{6}{16}$  gauge rifle, is about one fifth the weight of the ball; using Curtis and Harvey's powder altogether [and coarse grain, as it is much less liable *to cake* than fine] as the strongest and cleanest. For very long ranges, I would prefer one fourth to one third; for if the powder is quick, that quantity will burn, and the velocity and penetration being greater, the ball is less liable to be

\* This corresponds with what I have elsewhere stated, that it is impossible to insert the elongated shot perfectly true in a muzzle-loading gun without using a “starter.”—H. W. S. C.

affected by the wind, or rather is less affected by the wind, light or heavy, across the line of fire. A very light wind will materially affect a light ball, in a range of five to six hundred yards.

With a conical ball of twenty to the pound, or 5-10-inch caliber, and which two barrels [different lengths] of my "Maynard" carry, the charge of powder is only 40 grains, and is all its metal cartridge will take. Double this charge would only be "proportionate" with the ordinary charge used for the smaller caliber, and would require a much heavier barrel to prevent recoiling. Old *Leather Stocking* used to say that "a kicking rifle never carries a true aim," and so every good rifle shot has found it. I therefore prefer a smaller caliber, but heavier barrel, and larger proportionate charge of powder, in all my deer hunting excursions, as more effective and reliable at all ranges. If considered by some *theoretically right*, it is, in my experience, all *practically wrong*, to use a very heavy ball and light-barrel gun, with the charge of powder by no means "proportionate" to the ball; it is *always* less effective in aim and execution than a lighter ball with heavier barrel, and increased charge of powder. Unless, indeed, the sportsman desires to shoot farther than he can sight correctly, and chooses to carry a rifle of proper weight for his ounce ball, say 15 to 18 or 20 pounds, and using a

charge of some 100 grains of powder. Such a rifle, with a "telescope-sight," and a *mule* to transport it, might possibly kill a buffalo a mile! Besides the serious disadvantage of greater recoil, the light long barrel will spring in a greater or less degree, and tend materially to affect the accuracy of firing.

"At what ranges have you been most accustomed to shoot? and what do you consider the best shooting you have ever witnessed at any range?"

With muzzle-loading rifles, of ordinary size, from thirty or forty to one hundred yards, both at game and target firing; though at game, I have occasionally made good shots at 150 yards or more. But rarely with any great accuracy at longer range with the common hunting rifle, as usually sighted, and loaded at the muzzle.

"Have you had any experience in breech-loading rifles? and if so, how do they compare with muzzle-loaders in all essential points; and what breech-loader do you consider the best? In describing any experiments, please state as distinctly as possible the circumstances by which its results could in any way be affected, such as quantity and quality of powder; description of sights, whether telescopic or open; condition of the atmosphere, &c."

Within the past few years I have had considerable experience with breech-loading rifles; though, in practice, mainly confined to the Maynard rifles;

yet have carefully examined the construction of all that fell in my way. Some I would not use as a gift ; others, again, might answer very well for some purposes, but not for mine, being clumsy and heavy, if not too complicated and coarsely made, to work well any length of time. A few only were approved.

I first saw Dr. Maynard's rifle five or six years since, and in the hands of a friend, while hunting in the Alleghany mountains. It had the short barrel, only 20 inches in length, and large caliber ; it was literally an object of derision to our hunting companions, who were all advocates of, and used the long, old-fashioned muzzle-loaders. Yet, when we came to compare "the pop-gun," as they called it, with theirs of the greatest repute, at any distance over 100 yards, all their guns were beaten. The penetration was nearly double ; and when, at long range, the little gun was always in, or close to the mark, the big ones were as often as otherwise "nowhere."

Soon thereafter, the company made a rifle for me with several barrels, of different calibers, &c., such as I prescribed. It was manufactured under the direction and supervision of Wm. P. McFarland, who is one of the finest and most practical machinists in the country ; and if finished *con amore*, it is not any more perfect in fitting up and

shooting qualities than others generally of his make, and which I have fired, from the same factory.

The barrels are of steel ; two of them 32 inches ; two for conical balls of 46 to the pound, and the others 20 to the pound ; and for deer hunting I would even take the short 20-inch barrels, in preference to any muzzle-loader in the country, having compared the shooting qualities, amongst others, with a " Purdy " rifle, most elaborately finished, laminated steel barrel, a ball gauge, &c., &c., and at a cost in London of forty-six guineas, or \$230.

My " Maynard " is light, durable, and very neat ; the breech-loading apparatus throughout, from the setting the ball into the cartridge, has almost the precision and accuracy of watch-work ; and this I say, after a practical experience myself of thirty-five years in working in brass, iron, and steel, and in a business that could only prove a success by close fitting and fine finishing, viz. : die-sinking and press-making for medals, seals, &c.

There is no escape of gas ; and I have never known a ball to enter the target sidewise, when properly loaded in the cartridge. By the loader, a very simple affair, though quite as ingenious and perfect, the axis of the ball is set with mathematical precision to the axis of the bore, and it cannot vary. Loose ammunition can be used very expeditiously and well, instead of the loaded cartridge.

As good, if not "the best shooting" I "have ever witnessed," has been done by my 32-inch small caliber "Maynard." After properly arranging and adjusting the sights, and attaching a hair-trigger, firing with a rest, *four successive* balls at *sixty-six* yards, all breaking into the first hole, and all covered by a "York shilling"—a dime covered three entirely, and nearly all of the fourth ball; at *three hundred* yards (also with a rest—and the only sure test of the accuracy of a rifle) *three successive shots* were all within the compass of a visiting card, or less than a two-inch ring; the nearest within half an inch of the centre. A companion standing by, asked for a shot; and though he had not fired a rifle a dozen times, his shot was nearly as close as the others; proving satisfactorily that the gun, and not the marksman, was entitled to the credit of good shooting.

The Maynard barrels are all made of steel; which I consider far preferable to iron. It admits of boring and rifling with more precision, is clearer of flaws, and is more durable in the grooves, especially for breech-loaders, using no patch. It is probable that much of the superiority of the Maynard rifle is owing to the arrangement of the sights; three of them, front, middle (open with leaves), and rear or "peep" sight; the last raising and sliding with perfect accuracy, giving any desired range, and

having a very fine aperture ; affording, at the same time, a shield to the eye, and giving a *long* range of sight to a very *short* gun.

I have not used a rifle with a “telescopic sight ;” for without it [to judge by the time required with it] I could kill the deer, while another was getting ready “to draw his bead.” It is of little practical use in hunting ; none whatever, in a “snap” or *running shot* in the woods.

To be explicit and direct, as are the last queries, I will add that the rifle referred to weighs  $8\frac{1}{4}$  pounds ; length of barrel 32 inches, the conical ball 150 grains, the ordinary charge of powder 30 grains ; and the cartridge, when properly loaded, is absolutely water-proof. The rifling is with three broad grooves—the lands and grooves being equal ; the small caliber has one turn in *four* feet, the larger caliber one turn in about *five* feet. Taken as a whole, length and weight of the barrel, size of ball, and shooting qualities, together with true scientific principles in construction, and superior workmanship and finish, all combined, it excels any rifle I have ever seen for hunting purposes ; for it is light enough to carry all day without fatigue, yet has both length and weight for steady off-hand shooting. With a rest, the aim is almost unerring at any reasonable distance.

The opportunity has not yet occurred to test it,



but I feel very confident that with a clear, still atmosphere, and a standing shot, a deer could be killed at least twice out of three shots at five to six hundred yards; but much beyond this, there is little accuracy of vision; though at twice this range and more, the shot would certainly be fatal, if striking a vital part.

From the peculiarity of ammunition, the barrel is kept free and clear from fouling; and it is reported, on good authority, that the Maynard rifle has been fired five hundred and sixty-two shots without cleaning, "*and worked quite well*;" nor have I discovered the slightest indication of *leading* in the barrel; in fact, there cannot be any, if the ball is properly lubricated when set into the cartridge. Each cartridge may be used an indefinite number of times—say hundreds, without apparent injury or wear.

If the Maynard primer could be made as efficient as a good cap, the rifle could be fired from fifteen to eighteen times a minute; but I do not find it fully reliable; yet, with even a snap or two occasionally, it places the muzzle-loaders fairly in the shade.

A year or two since, we had a fair test of the two; for a hunting companion with me fired at a deer swimming, at over 100 yards, and missing; before he was much, if any, more than half re-

loaded I fired *three* balls *into* the same deer (including a snap or two), and killing him, before he could escape. The last shot was evidently unnecessary ; and it was merely as a test of the rapid and effective firing of the "Maynard," compared with a muzzle-loader ; and the *comparison* was something like the old-fashioned stage coach with the modern locomotive !

The same afternoon, with an accession of several comrades, all eager for the trophy, and all good shots—and, with the exception of the rifle, greatly my superiors in vigor and the chase—I killed a second deer at very long range, after three or four ineffectual shots from their rifles.

The "Maynard" is considered entirely efficient at *more than twice* the range of ordinary muzzle-loading rifles ; and the greater the range the more marked the difference.\* I yet know a genuine

\* In conversation with an officer of rank, and who was perfectly familiar with the Maynard rifle in his many hunting excursions, he alluded to the deadly effect of these rifles in battle ; stating that "the terrible slaughter of the Union forces at Ball's Bluff, was mainly owing to a Confederate regiment being armed with the Maynard rifles ; nothing could stand before them, for they could be fired in expert hands with almost unerring and deadly aim, eight to ten times a minute, and at a range of many hundred yards." He also observed, "I saved my picket guard from capture by a squad of cavalry, four or five times our own number, by

“Leather Stocking” or two in the mountains who cling to the old, obsolete flint lock with great pertinacity—almost *affection* ; one of them don’t like the “*percushion*,” as it is *too quick* for his aim ; while the other carries a little ball of *wax* to tinker up the edges of his old, worn-out *pan*, to keep his priming from wasting, every time he shoots his old firelock. In my opinion, the breech-loader is destined to supersede its prototype, just as certainly and effectually as the percussion has done the flint lock.

For many years I used fine *double-barrelled* muzzle-loading rifles, though uncomfortably heavy ; but the advantages of a *well-constructed* and light breech-loading rifle are so great, that I could not now be induced to use the former as a gift. The

having mine at my side. The onset was furious, and the order given to cut every man down ; but our firing was so rapid and effective, that the rebels could not stand it, and fled, supposing, no doubt, that they had got into an ambuscade. I lost but one man, while a number of their horses went off riderless. *This sword*, at my side, is a Maynard trophy, won in that fight.” As this comes within the scope of the queries, I refer to these incidents to show the opinion of a most competent judge of the Maynard rifle—one who is a practised hunter, as well as an extensive dealer and manufacturer of guns and rifles for twenty years. He gave it as his opinion, that for convenient handling, penetration, and accurate shooting, it could not be surpassed ; indeed, all things considered, it was the best rifle he ever saw.

breech-loader can be readily charged in a few seconds, and in any position ;—standing, sitting, lying down, or even on horseback at a gallop : and without perceptible motion of the body or hands, to alarm the game, although the hunter may be in full view. It has repeatedly occurred in my hunting, that two or more shots can be obtained with a breech-loading rifle, at as many deer near each other, and before they can get out of range. With the single-barrel muzzle-loader this is next to impossible ; as the requisite time, exertion and motion of the body in reloading, alarms and enables the others to escape after the first shot.

I have also a finely finished breech-loading steel barrel sporting rifle made by Merrill & Co., of Baltimore. So far as I have experimented with it, but only to a very limited extent as yet, the loading and firing are quite satisfactory ; not being complicated, and apparently durable in the most material working parts. It is light, neat, and strong ; the paper and prepared muslin cartridge is used, but a metal one will be substituted for it. I will here add a few words more on projectiles, and the expression of an opinion, and most decidedly so, that no breech-loading rifle using the paper cartridge and a *conical* ball, will shoot with the *same uniform precision* as with an accurately fitting, and correctly loaded *metal* one. The *round* ball, properly patched, with-

in a prepared muslin cartridge [readily done and lubricated also] is much more reliable ; indeed, it is the only form of projectile, in my experience, to be depended upon in either breech or muzzle loader for both accuracy and penetration, unless the metal cartridge is used.

An inaccuracy in setting the *conical* ball into the cartridge, even so slight that the eye can scarcely, if at all, detect it, will make it vary very materially, and often cause it to enter sidewise. True, we may use a patched *slug*, and loaded tolerably well with the rod, but the friction is enormous ; nor have I found the *round, unpatched* ball in a breech-loader sufficiently reliable. It cannot be properly lubricated, will *lead* the barrel, and is very liable to strip in the grooves, unless much larger than the caliber ; in that case it is merely transformed into a clumsy blunt end *slug*.\*

The capped copper cartridge is excellent in some

\* I may further remark that a perfect ball, whatever the form, whether conical or round, is very essential to good shooting ; and to have such, I use the Patent Ladle, invented by A. N. Tupper, of Potsdam, New York. Each ball is cast with a considerable head of metal, say a pound or two, and clear of dross and impurity ; consequently, every ball is as perfect as if turned in a lathe ; and the most inexperienced tyro is just as competent to its use as the most scientific operator ; and the balls are much more rapidly moulded also. The whole thing is simple, cheap, and most efficient.

respects ; the certainty of fire, great facility of loading, and penetration ; and though it may be objectionable in others, it will probably come into general use ; these objections are, the difficulty, if not danger in preparation, the possibility of firing the *magazine* by a chance blow or fall on a stone, the increased expense, and also the uncertainty of obtaining at all times and situations the exact and requisite article in size, quality, &c. ; for, without these the rifle is a useless appendage. I know the copper cartridge can be readily exploded by a light blow of a hammer, and the cartridge resting on wood, as I have so exploded them repeatedly ; nor is a steel or iron hammer required ; a *lead*en one answers just as well. The experiment is a dangerous one, unless performed with judgment ; and it is about equally dangerous to stand either behind or before a copper cartridge thus exploded.

These views, however, as to accidental firing may be matter of opinion. I only judge for myself, in adding that I prefer the rifle for which the ammunition is readily prepared wherever powder and lead are at hand ; and when ten minutes will suffice to load several dozen cartridges. There may be, possibly, but little danger of *accidental* explosion in the use of the capped cartridge ; but I have known too many accidents from *careless handling* of firearms and ammunition, to be willing to in-

crease the personal risk, or encounter the *dread* of it even, by carrying a score of miniature *bomb shells* in my belt or pockets, "ready capped and primed!" *Mais chacun à son gout.*

With the Merrill rifle, there is a neat and very useful appendage attached to the lever, and answering a double purpose; in re-loading, it always removes the exploded cap, also the empty cartridge, and effectually prevents accidental firing until the "lever and plunger" are securely in place. With the prepared muslin cartridge there appears to be very little escape of gas; yet, there would probably be some little in loading with loose ammunition.

It appears to be well adapted to hunting purposes, and far superior in handling to the muzzle-loader; for any hunter who has the tact and skill to kill a deer, can readily prepare his own cartridges, and fire eight or ten times with the new, to once or twice with the *Old Fusee*. Another strong recommendation in its favor with many, is the cost. The manufacturers advise me that they can furnish a superior hunting rifle at quite a reasonable price—not much above a well-finished muzzle-loader. With some modifications as to the cartridge, sights, &c., and as suggested by experience, the Merrill rifle will doubtless win its way to notoriety and favor. But how long these inventive champions can lay claim to precedence or preëminence, in this

age, so fertile in inventions and improvements in every branch of mechanical science, is a question that time alone can determine.

But I have far exceeded my prescribed limits when taking up the pen, and must conclude these desultory remarks. If, however, you can "winnow any wheat from the chaff," so as to benefit others—*gleaned*, as may truly be said, by a few moments at a time, snatched from more important and engrossing business cares, my object will be fully attained.

I am very respectfully,

EDWARD STABLER.



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